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ABSTRACT

The use of metrics in home economics taught at all levels is presented in this teacher's guide. Following an introduction on the history of the metric system and future use in the United States, section 2 presents information on bringing metrics into the classroom: changes in home economics (food and nutrition, clothing and textiles, and housing, furnishings, and equipment) in relation to an adoption of the metric system; principles and guidelines for teaching metrics; a suggested timeline for incorporating metrics into all schools in New York State; and sample guidelines for schools developing a metric policy. Section 3 contains transparency masters and a narrative script for presenting general background on the metric system to consumer or homemaking classes at junior high through adult levels. Section 4 provides hands-on metric learning activities. Metric units in food and clothing are discussed in the concluding section. Tables of metric units for measuring food and a discussion of the kinds of utensils are followed by twelve metric recipes. Metric clothing sizes and a sample pattern envelope are illustrated. The appendix includes a glossary of terms and a list of references: books, instructional materials, and articles. (JH)

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EVERYDAY METRICS FOR HOME ECONOMICS

A Resource Guide for Home Economics Teachers

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°C meter
gram cm
kg liter

The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Bureau of Occupational Education Curriculum Development
Albany, New York 12234
1978

CE 017 979

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FOREWORD

This publication was developed as an aid to home economics teachers on all levels. The ideas it contains are applicable wherever measurements are involved.

The idea for this publication came from Mary Ann Etu, Associate in the Bureau of Home Economics Education and member of the Metric Committee of the State Education Department. She also determined the content of the publication and collected the materials on which it is based. E. Noah Gould, Associate in the Bureau of Occupational Education Curriculum Development, organized and edited the materials as needed to achieve the present form of the publication.

We gratefully acknowledge permission of the Orange County Department of Education, Santa Ana, California, to reprint many pages from their publication *SI: A Metric Workbook for Teachers of Consumer and Homemaking Education*. That department has also graciously agreed to our making some changes in this material as we have reprinted it, including use of the spellings *meter* and *liter*.

We also gratefully acknowledge permission to reprint materials from the *Illinois Teacher of Home Economics* and from the McCall Pattern Company. More specific acknowledgements appear on the pages showing those reprinted materials.

Bureau of Occupational Education
Curriculum Development

Bureau of Home Economics Education

CONTENTS

		Page
	FOREWORD	iii
I.	INTRODUCTION	1
	History of the Metric System	1
	Is the United States Going Metric?	3
II.	BRINGING METRICS INTO THE CLASSROOM	5
	Metrics and Home Economics	5
	Teaching Metrics	8
	Suggested Metric Timeline for All Schools in New York State	12
	Sample Guidelines for a Metrication Policy	13
III.	LEARNING THE METRIC SYSTEM	14
	Masters for Making Transparencies	14
	Transparency Miniatures and Narration	51
IV.	LEARNING TO USE METRIC UNITS	62
	Learn-by-Doing Workshop	62
V.	METRIC UNITS IN FOOD AND CLOTHING	72
	Metrics and Food	72
	Metrics and Clothing	81
	APPENDIX	86
	Glossary of Terms	86
	List of References	87

I. INTRODUCTION

HISTORY OF THE METRIC SYSTEM

The metric system originated in France and was adopted by the French National Assembly in 1795. Most nations in Europe and Central and South America adopted it for commercial use during the middle and latter half of the 19th century. After World War II, the Soviet Union and China made the use of metric units mandatory. India and Japan followed in the 1950's. England began a 10-year conversion to the metric system in 1965 and South Africa converted during the same period. In 1969 New Zealand began an 8-year conversion, and in 1970 Australia and Canada announced their commitment to metrication.

In the U.S. Use of the metric system in the United States was made legal but not mandatory by an Act of Congress in 1866. Then a law of 1893 made metric measurement the fundamental standard in this country. In this law the foot, the pound, and other customary measuring units are defined in terms of the metric units.

A number of bills on the metric system were introduced in Congress during the past several decades but none was enacted until the Metric Study Bill was passed in 1968. This law resulted in a study issued in 1971 entitled "A Metric America — A Decision Whose Time Has Come." Following this study the Metric Conversion Act of 1975 was produced. This law (which is discussed elsewhere in this book) provides for a Metric Board to promote the voluntary conversion.

The schools must lead — and not lag — in the movement toward metrication. The process of conversion is much smoother and much less costly when education changes over early. In England, the schools got off to a slow start in metrics instruction and there were many problems in that country's conversion. By contrast, Australia's schools were in the forefront of the conversion and a much more orderly transition took place in that country.

Concerned with providing leadership to the "march toward metric," the New York State Education Department, in the fall of 1973, formed a small committee to study and organize metrication in New York State education. An enlarged committee continues to guide metric education in the schools of New York State.

Six school systems in New York State are working under federal grants to develop methods for providing metric education. This work is now continuing and is aimed at providing demonstrations of the methods to other interested educators, once the projects are completed.

In the last several years the State Education Department has conducted more than 200 workshops in metric education for teachers and school administrators. Additional workshops are being given as requests are received.

Other activities of the Department aimed at advancing metrication include the following:

- In January 1975 the Commissioner of Education issued a policy statement requiring metric instruction in all schools of the State.

- November 17, 1976 was proclaimed by the Commissioner as Metric Awareness Day. This resulted in a spurt of metric activities in many schools.

- The Department helped form and has been participating in the activities of the Metric Education Consortium of the Northeast States. This consortium aims to promote the development of more materials and methods for metric education. These are mainly for the elementary and junior high school levels.

- The Department participates in operation of the State Metric Council which brings together representatives of agencies of New York State Government to promote metrication.

The Department has also issued a number of publications to aid in metrication. These are identified in the List of References. In addition, Governor Carey proclaimed the week of May 7-13, 1978 as Metric Week for New York State.

IS THE UNITED STATES GOING METRIC?

The question above should be reworded to ask *not* whether the United States is going metric *but rather*: When will metrication in the United States be substantially completed? This country has been moving into metrics for many years but we now need a concerted drive to bring metrics to the areas which have not been metricated. We cannot remain the only industralized country not on metrics. The pressure of a metric world and the great convenience of the metric system are powerful forces pushing us toward metrication.

Advantages

The advantages of our being on the metric system can be summarized as follows:

1. We Will Make Great Gains in International Trade. Metrication will increase our exports and bring us several billion dollars of benefits.

2. The Metric System Is Easier To Use. The metric measuring units all taken together constitute a decimal system which provides great convenience. Measurements can be made with one consistent set of units without the need for specifying something like feet and inches or pounds and ounces.

3. Calculations Are Much Easier and Faster. This is true for mental and manual computations as well as those using desk calculators and electronic computers. To multiply 1.3 meters by 2.2 meters is much much easier than multiplying $4'2\frac{3}{8}"$ by $7'2\frac{1}{2}"$. Besides being easier and faster, calculations in metric units are less likely to produce errors.

4. Metrics Is Especially Convenient and Efficient in the Laboratory. The work of a laboratory puts a premium on accuracy and efficiency which can be much more easily achieved with metric units.

5. Eliminates a Double Measuring System. When metrics is widely adopted in the United States, the customary measuring system will be virtually eliminated. This will leave just one system of units instead of the two we have now. It will also eliminate much confusion and will cut costs.

6. Makes Possible a Worldwide Measuring System. Our metrication will help to make metrics a truly worldwide system. This will mean that food, clothing, home furnishings and equipment, paper, hardware, gasoline, and everything else purchased will be bought in the same units throughout the world. It will mean, for example, that a metal nut made in the United States will fit a bolt made in Norway or in India.

Disadvantages

One of the greatest deterrents to metrication is the difficulty of getting the general population to accept the change. Resistance to change is a natural human response. But the great benefits of making the changeover will overcome this resistance. Industry and education have vital roles to play in helping the general public accept the metric system.

The change to metrics will also involve some expense. However, this expense will be compensated for by the savings that will result after the system comes into general use. With careful planning, much of the change to new sizes of supplies and equipment can be achieved when normal replacements are made. This will greatly reduce the cost of changeover.

American Uses of Metric

Many large American corporations are already using the metric system: IBM, Honeywell, General Motors, Regal-Beloit, ITT, General Mills, and many others. The 1974 Ford Pinto (and later models) have metric engines. The 1976 Chevette is claimed to be the first American-built all-metric car.

We have 35-mm film, 16-mm film, and 8-mm film (Super 8). In restaurants we often order wine by the liter or half-liter. Sports enthusiasts are familiar with the 100-meter track race and the 50-meter swimming pool. We read in the newspapers about narcotics officers confiscating a "kilo" (meaning kilogram) of marijuana. The pharmaceutical industry has been using the metric system for years. Distances and elevations in the firing of weapons by the U.S. Army are measured in metrics.

The Metric Conversion Act of 1975 became Public Law 94-168 in December of that year. It declares the national policy of "...coordinating the increasing use of the metric system in the United States...." It provides for the appointment of a U.S. Metric Board of 17 people: 4 at-large members to represent consumer interests, 12 representing various segments of society, and a chairman. Once the Board begins to operate, it is to appoint a full-time executive director to carry out the policies of the Board in promoting the conversion to metrics.

The Board has no compulsory powers, but by planning, coordinating, and providing public education it will promote the conversion. The intent of the law is to encourage action by individual industries and many industries have already started action toward conversion.

II. BRINGING METRICS INTO THE CLASSROOM

METRICS AND HOME ECONOMICS

The change to metric measurement now taking place in home economics raises some new questions which are discussed on these pages.

Food and Nutrition

Metric units are being used to measure some quantities in nutrition. At present, nutrition information is given on food labels in a combination of customary and metric units. Frequently the serving size is given in customary units and the amounts of protein, carbohydrate, and fat in grams.

People today are familiar with calories as a measure of the amount of energy in various foods and how this amount relates to gaining or losing weight. In the metric system we will be using the joule (actually the kilojoule) in place of the calorie. The current food models (issued 1974) for the Basic Four Food Groups of the National Dairy Council show both calories and joules.

In the conversion of food packages from customary to metric units we could make either a *soft conversion* or a *hard conversion*. In a soft conversion, neither the package nor its contents is changed; only the wording of the label is changed to add the contents in metric units. In a hard conversion, the package is redesigned to accommodate a round number of metric units of the contents.

For example, suppose we have a chocolate bar with a net weight of 1.5 ounces. For a soft conversion, no change is made except to add *42.5 grams* (in parentheses) on the label. For a hard conversion, the package is redesigned to contain, perhaps 50 grams of chocolate. It would then show *50 grams* on the label but no weight in customary units.

Conversion of food packages from customary to metric units usually simplifies the packaging by reducing the number of different sizes of packages. Customers will be able to distinguish the different sizes more easily than the customary sizes.

A good example of this simplification has occurred in the wine industry. In this change, 7 metric sizes of bottles are replacing 16 domestic sizes and 27 imported sizes. In the United States, incidentally, the metric sizes of wine bottles will be required by law beginning January 1, 1979.

For home canning, quart and pint jars will be replaced by 1-liter and 500-milliliter jars. Research is being done to determine processing times for the larger sizes of containers. The shape of the jars will also be a factor in the production of new canning equipment.

Clothing and Textiles

The change to metrics for clothing and textiles will be easier for the consumer than some of the other metrication changes. The industry is working out many of the problems. Clothing sizes will be similar to the present ones but will be based on the centimeter. For example, men's shirts will probably be sized by the number of centimeters around the neck.

Metric units are marked on pattern instruction sheets, pattern books, and pattern pieces. The pattern industry will continue to supply needed information on the back of the envelope containing the pattern. And the information will be in metric rather than customary units. (See the sample Back of Pattern Envelope on page 85.) Fabrics will be sold by the meter and the width will be measured in centimeters. Fabric widths may be altered slightly so they can be expressed in round numbers. Home sewers will find that working with centimeter units is easier than inches and fractions.

Only a few tools will change for the home sewer. *Metric* tape measures, rules, meter sticks, sewing gages, cutting boards, sleeve guides, and hem guides are already being marketed. Some sewing machines manufactured in other countries have seam-width guidelines in metric units. Stitch-length regulators and buttonhole templates will also be affected by the metric conversion.

Housing, Furnishings, and Equipment

In metric measurement the dimensions of a house are in meters. The land on which it is built is measured in hectares. A piece of land 100 m by 100 m is one hectare and is about 2.5 acres. Floor covering and wall covering materials will be measured in meters and will be sold by the square meter.

Temperatures in a metric house are read in degrees Celsius and are regulated on a thermostat with Celsius caliabrations. A comfortable room temperature is 20 degrees C.

Sheets, blankets, mattresses, towels, shower curtains, table linens, and draperies are measured in centimeters. Therefore dimensions of beds, table tops, and windows must be taken in the same units for purchases of these household items.

Before buying a household appliance determine where you want to place it in the home and measure the space in centimeters. Then take along a metric tape and measure the appliance in the store to assure that it will fit the space you have. Other information helpful in the purchase of specific appliances follows.

For television sets:
The screen size and overall dimensions are in centimeters.

For washers and dryers:
The mass (weight) of a load of clothes is in kilograms.
Water used is in liters.
Detergent is in milliliters.

Water temperature is in degrees Celsius.
Electrical power required is in watts.
Gas used is in cubic meters.

For refrigerators and freezers:
Capacity of the interior is in cubic meters.

The motorist will soon find road signs with distances in kilometers and speedometers showing kilometers per hour. (The speed limit of 55 mph is about 88 km/h.) Maps will show distances in kilometers. Service stations will sell gasoline in liters. (A gallon is a little less than 3.8 liters and 60 cents per gallon is about equal to 16 cents per liter.) American tires are now being converted to metric sizes and tire gages will measure air pressure in kilopascals.

Standardization in all areas will make measurement less complicated and confusing. Careful planning is needed to coordinate the timing, kind, and degree of change. As a home economist, you should gather information and investigate what will occur that will affect the consumer as metrication takes place in specific areas. Be ready to assist your students and the community during this period of adjustment.

TEACHING METRICS

The article below, "Principles for Teaching Metrics," was written by Dr. Judy Oppert, chairperson of Home Economics Education at the University of Vermont, and recognized authority on metrics in home economics. These principles were developed to aid teachers in presenting the metric system to students above the elementary level. This article is reprinted by permission from the May-June 1975 issue of Illinois Teacher of Home Economics.

Following the article is a suggested set of guidelines which should help in the production and purchase of metric instructional materials.

The following principles have been developed to aid teachers in the presentation of the metric system of measurement to students above the elementary level. These principles or generalizations have been gathered from the author's experience and the writings of many people who have taught or studied the teaching of the metric system in other countries as well as in the United States.

1. Understanding the need for adopting the metric system and its impact on the nation as well as on home economics, will help the teacher to persuade others to learn the metric system. The teacher must be convinced that the metric system is useful, important, and worth learning before she can convince the students that the metric system is a useful measurement system.

   Some students may need reassurance that the change will not be too difficult or threatening. Whenever the teacher finds some resistance she needs to be prepared to deal with it in a positive manner. Students learning the metric system experience affective changes as well as developing new knowledge and skills.

   One way to increase awareness is to attach signs to objects in the students' surroundings indicating appropriate metric units.

2. Converting from the customary measurement system to metric or vice versa can be confusing, involve many mathematical calculations, take a lot of time, create a false complexity about the metric system and help to maintain the customary system. Conversion seldom helps the student learn either system. If the need to do conversions arises, there are conversion tables and mechanical conversion devices.

   Approximate conversions, such as "1 kilogram is a little heavier than 2 pounds," do help the students with a knowledge of both systems visualize relationships. Other appropriate conversions include:

1 meter is a little longer than 1 yard,
1 kilometer is a little longer than ½ mile, and
1 liter is a little larger than 1 quart.

The emphasis is on understanding the two systems, and the relationships between them, rather than the arithmetic of conversion.

Minimize conversions within the metric system to commonly used units adjacent in size. Consumers will seldom need to convert kilometers to millimeters. They will more frequently convert millimeters to centimeters or vice versa.

3. Illustrating the relationships between the metric units of length, area, volume, and mass helps students to understand the logic, simplicity, and design of the metric system. Changing from one unit to another is much simpler in the metric system than it is in the customary system.

   Cooking involves the interactions of mass, volume, temperature, energy, and time. Students will need help with the new measuring units and tools in this area. Teachers working with customary measures of spoons, cups, and ounces may find it worthwhile to develop the relationship of these units with appropriate metric units.

4. Emphasizing measurement activities where the students are actively involved in the measurement processes and experiences will help the students develop an understanding of the metric system. Students become familiar with the metric system and learn to think in terms of metric units as they participate in realistic experiences. Activity-based experiences have been more effective than lectures for teaching the metric system. The choice of strategies for teaching the metric system can facilitate or impede "thinking metric."

   Activity oriented measurement experiences include estimation and verification by direct measurement, developing relationships between units, speaking and writing with metric units, making comparisons, and drawing and/or using maps and graphs. Use metric units at every opportunity and encourage the students to THINK METRIC.

   The teacher can encourage students to choose a unit of measure and use it to measure a variety of objects. After repeated experiences with the measurement unit, the students will be able to estimate the size of other objects with a degree of accuracy. It has been suggested that estimates of length should have no more than ten percent error, if they are to be considered a "good guess" [NCTM Metric Implementation Committee. "Metric: Not If, But How," *The Arithmetic Teacher*, May 1974, 21(5), 366.].

   Another activity that has been successful is to encourage students to find body dimensions and common items that have the same measurement as a metric unit. (Example: the width of a small fingernail is approximately equal to 1 cm). The student can use the item as a reference point for future comparisons. It is helpful to measure one's own mass as well as the mass of a stapler and paper clip, for example.

Students can build, modify, or convert many items now utlizing customary measurement units to items with metric units. This can be a learning experience as well as an aid in modifying existing equipment. Practical experiences and situations such as those described above have been effective with students of all ages.

5. Consistency in spelling, notation for decimal placement, and terminology eliminates needless confusion. For similar reasons avoid using materials and equipment that utlize customary units, if possible. Reject materials that contain the wrong symbols, errors, units not in SI (International System of Units), emphasis on conversion techniques, and information that is unsuitable. Write the publishers or manufacturers so they know why you are not pleased with their products. Likewise, notify the producers when you find a product that is particularly good.

6. The continued use of customary and metric units makes it more difficult to unlearn the customary measurements, and conversion from one system of units to the other becomes a common but undesirable practice. Encourage the students to use only metric units after the initial introduction of metric units. Also, look for measuring tools that contain only metric units so the students cannot rely on the customary units.

7. The use of metric measurement in the home and community reinforces the school activities and aids learning and retention. Both adults and children need to be able to practice using metric units in the home and community as well as at school.

   Involve and inform parents and other adults in the process of metrication as well as children. Parents like to be able to assist their children and the idea of a "generation gap" is usually not appealing to them.

8. If the students gain self-confidence in working with the metric units they will be more likely to continue using them in situations outside of the classroom. Reassure them that the metric system is easier to use and try not to over-dramatize the difficulties in changing systems.

9. Conversion costs can be reduced by timing the replacement of appropriate items so they are coordinated and replaced at the end of their regular lifespan, whenever possible. Make a replacement schedule for existing equipment and books that contain customary units. The costs will be less if metric materials are added as the customary materials wear out. Also, the costs will be spread over several years, and, in some cases, there will be no added expense for metric conversion.

Guidelines for Choosing Metric Curriculum Materials

1. BE SELECTIVE. DON'T OVERBUY! Some of the best devices are teacher-made from inexpensive materials.

2. The material SHOULD BE ACCURATE AND SHOULD USE THE NOTATION AND TERMINOLOGY OF SI (International System of Units.) Exceptions: The spellings *meter* and *liter* are now prescribed for use in the United States by the National Bureau of Standards. Although *mass* is technically preferable when using grams and is best if teachers are comfortable using it, *weight* will probably be used in everyday life by most people.

3. Materials should TEACH STUDENTS TO "THINK METRIC" — not to convert measurements from metric to customary.

4. Materials should stress an ACTIVITY-ORIENTED APPROACH — not a workbook or paper and pencil approach.

5. Materials should BE EASY TO USE and should have teacher's manuals where necessary.

6. The complexity of the materials SHOULD FIT THE GRADE LEVEL where they will be used.

7. Materials should STRESS THE DECIMAL NATURE of the metric system.

SUGGESTED METRIC TIMELINE FOR ALL SCHOOLS IN NEW YORK STATE

The following list of dates was included in a statement issued in 1976 by the Commissioner of Education. Although the earlier dates will be past by the time the present publication appears, the information can be quite helpful to school administrators.

During 1976-77	Appointment of Metric Coordinator • establish a metric committee • acquisition of workshop materials • accumulation of software resources • teacher awareness workshops • public awareness workshops • flow chart of introduction
By January 1978	Inventory of equipment by all departments • set purchase plan for software, small tools, and major equipment • teacher orientation classes • survey of texts and references for possible metric supplementation
By June 1978	Inservice workshops by grade level and departments • preparation of teaching materials • rewriting of worksheets and project plans, science/math experiences, physical education/sports instruction • administrative survey of support needs: i.e., nurse, health, bus service, and purchasing practices • book orders include metric
By June 1979	Substantial substitution of metric for customary in-classroom work at all levels • use in references and project plans • parent workshops
By June 1980	Metric year • use of metric in all grades and subjects • customary measurement a minor part of measurement education • *metric* the predominant measurement system

The guidelines stated on the next page can become the basis for policy statements on metrication by a school district or other education agency.

SAMPLE GUIDELINES FOR A METRICATION POLICY

IT IS THE POLICY OF _____
school district that:

1. the metric system become the principal system of measure in the curriculum of the elementary and secondary schools of the district.
2. metric measure be implemented in the schools with the express intention of ensuring that programs of instruction become predominantly metric by September 1980.
3. metrication be applicable to all areas of the curriculum and that all measured quantities, wherever appropriate, be stated in metric units,
4. the units and symbols of the metric system taught in the schools conform to those of the International System of Units, known as SI.
5. metric education be accepted as an opportunity to reassess pedagogical approaches to measurement as a whole; that students be provided with opportunities to acquire a practical and experimental knowledge of metric units through activities that involve comparing, estimating, measuring, and related problem-solving.
6. metric changes in the curriculum be coordinated with corresponding changes in industry and business.
7. metric learning materials in the school be put into use gradually, after planning and after considering the attrition, modification, and replacement of old materials, as well as the availability of new materials.

III. LEARNING THE METRIC SYSTEM

MASTERS FOR MAKING TRANSPARENCIES

The following pages can be used as masters for transparencies to give a general background on the metric system. A presentation of this kind is appropriate for both consumer and homemaking education classes, and for levels from junior high school through adult.

To make transparencies, you can obtain information from your own school system. After they are made, cut the transparencies in half so you will be able to show one numbered transparency at a time.

Before showing the transparencies, you should give the students a chart showing the names and definitions of the basic metric units. (You can obtain such a chart from other publications.) The students should have these charts in hand when you go through the transparencies with them.

The following pages of Masters for Making Transparencies and those showing Transparency Miniatures and Narration are reproduced with a few small changes from *SI: A Metric Workbook for Teachers of Consumer and Homemaking Education* published by the Orange County Department of Education, Santa Ana, California. In these pages as they appear in that publication, the spellings *metre* and *litre* are used according to the International System of Units. After that publication was produced, the National Bureau of Standards established the policy for the United States of using *meter* and *liter*. The latter spellings are used throughout the present publication.

Before you show the transparencies to the students, plan the placement of them on the overhead projector as follows. Place one transparency on the projector, show it on the screen or other surface you will be using, and move it into the position *you* prefer. Then put masking tape on the glass to mark the position you prefer for each succeeding transparency.

The Transparency Miniatures and Narration to help you in your presentation begin on page 51.

1

SI

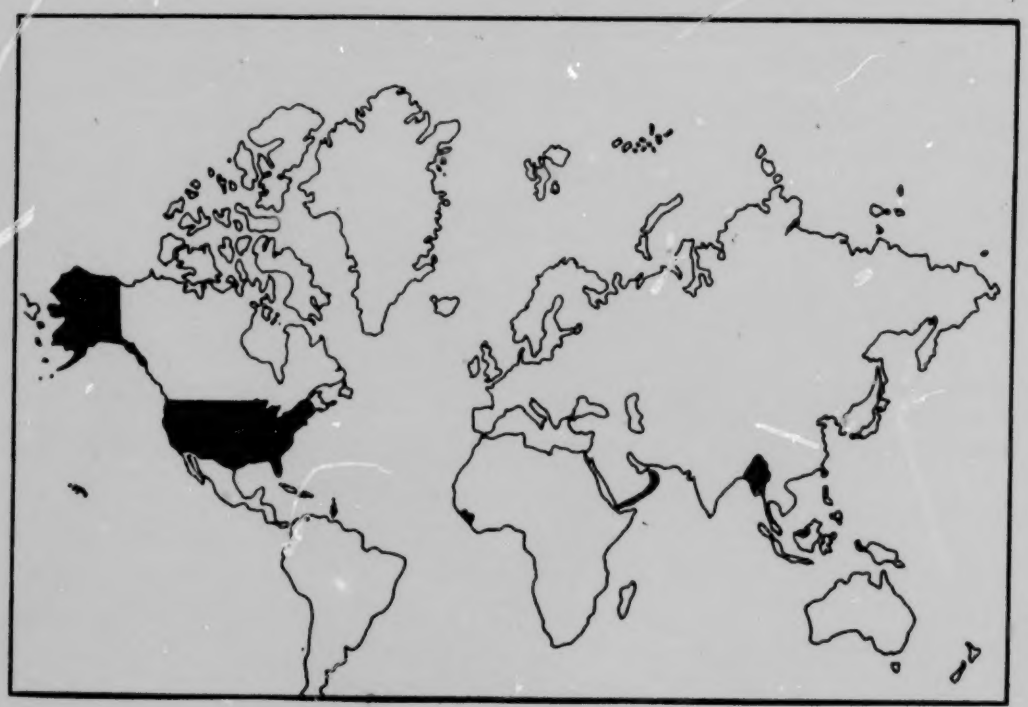
SYSTÈME INTERNATIONAL

Système International d'Unités, or

International System of Units

2

● ISLANDS IN A METRIC WORLD



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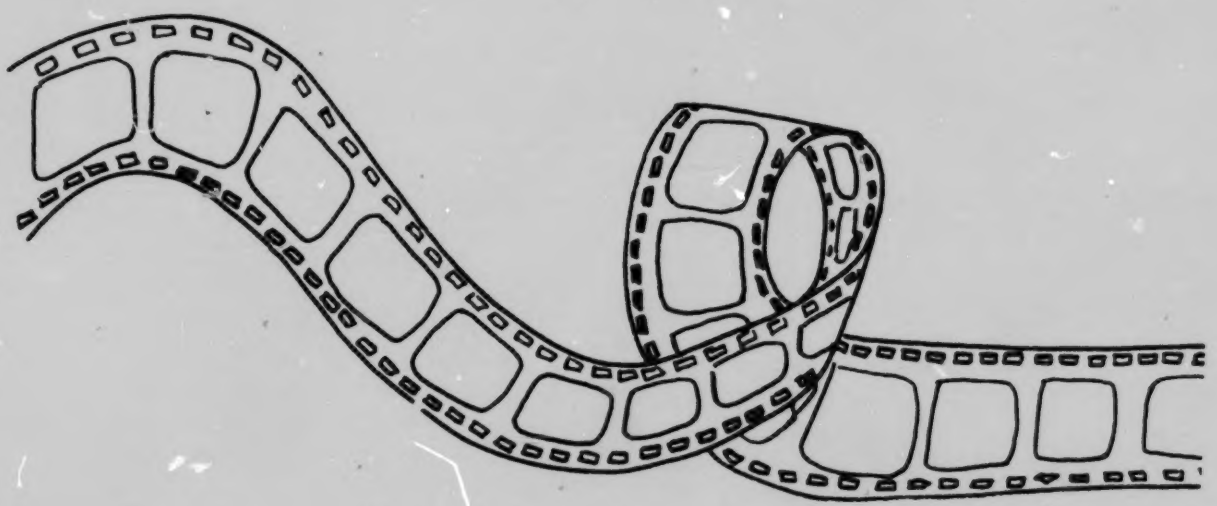


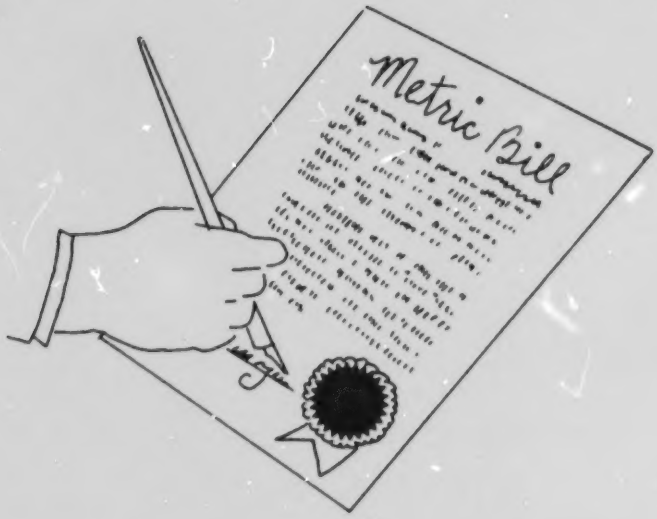
9

10

1 GLASS OF WHOLE MILK (210 g) CONTAINS:

7.4	g	Protein
8.2	g	Fat
10.3	g	Carbohydrate
0.25	g	Calcium
0.20	g	Phosphorus
0.2	mg	Iron
0.08	mg	Thiamine
0.36	mg	Riboflavin
0.21	mg	Niacin
2.1	mg	Vitamin C

11



12

5

6

___100

___200

____400

____ Meters

7

100-Meter Swim Event

8

POLICE FIND 1 KILO OF MARIJUANA

"CHILDREN HAVE to have some kind of guidance—that's the primary reason to say 'No' to them. They need to be out of your hair; you need to be able to get them to accept some limitations, and you need to protect them and demonstrate your love for them. All these needs and many more are incorporated in the ability to say 'No.' "

The speaker was Dr. Edwin S. Kessler, director of Children's Psychiatric Services at Georgetown University Medical Center in Washington, D.C. His eyes were warm and knowing behind the glasses, and his moustache and thinning hair helped to reinforce the psychiatrist's father-figure image.

"Take guidance," he continued. "The idea is to establish a set of rules that can be followed not only as a child, but later on as well. For the most part, I would say almost any child who is not given some limits, who is not helped by a judicious 'No,' is going to become undisciplined, wild, aggressive—and frightened. He doesn't know where to draw the line.

A child whose instincts are permitted full sway is likely to be a terrified child. He shows signs of extreme anxiety because somehow he knows that if his parents can't help him control his impulses, *he* certainly can't. To learn some kind of control over his own strong inner impulses he must get assistance from his parents. This assistance comes by defining limits, and you define limits by saying 'No.' "

"How do you know which approach you're taking?" I asked. "Where do you draw the line between his needs and your own convenience?"

"A lot of it, of course, is common sense, and the culture helps a lot," Dr. Kessler replied. "There are certain standard things, sets of behavior that require a 'No' because the culture has established both the action and the time at which it takes place. 'No, you cannot continue to soil your diapers.'"

GET READY TO . . .

GO METRIC

QUANTITY	UNIT	SI SYMBOL
Length	meter	m
Volume	liter	L
Mass (Weight)	gram	g
Temperature	degree Celsius	°C

15

QUANTITY	UNIT	SI SYMBOL
Length	_____	m
Volume	_____	L
Mass (Weight)	_____	g
Temperature	_____	°C

16

QUANTITY	UNIT	SI SYMBOL
Length	meter	m
Volume	liter	L
Mass (Weight)	gram	g
Temperature	degree Celsius	°C

QUANTITY	UNIT	SI SYMBOL
Length	meter	m
Mass (Weight)	kilogram	kg
Time	second	s
Electric Current	ampere	a
Temperature	Celsius	C
Luminous Intensity	candela	cd
Amount of Substance	mole	mol

PREFIXES TO MAKE THEM smaller

PREFIX	QUANTITY	CLUE TO REMEMBER
deci-	(1/10th or 0.1)	The decimal system based on tens
centi-	(1/100th or 0.01)	The cent
milli-	(1/1 000th or 0.001)	The millipede

19

prefixes TO MAKE THEM LARGER

kilo-	x 1 000
mega-	x A million

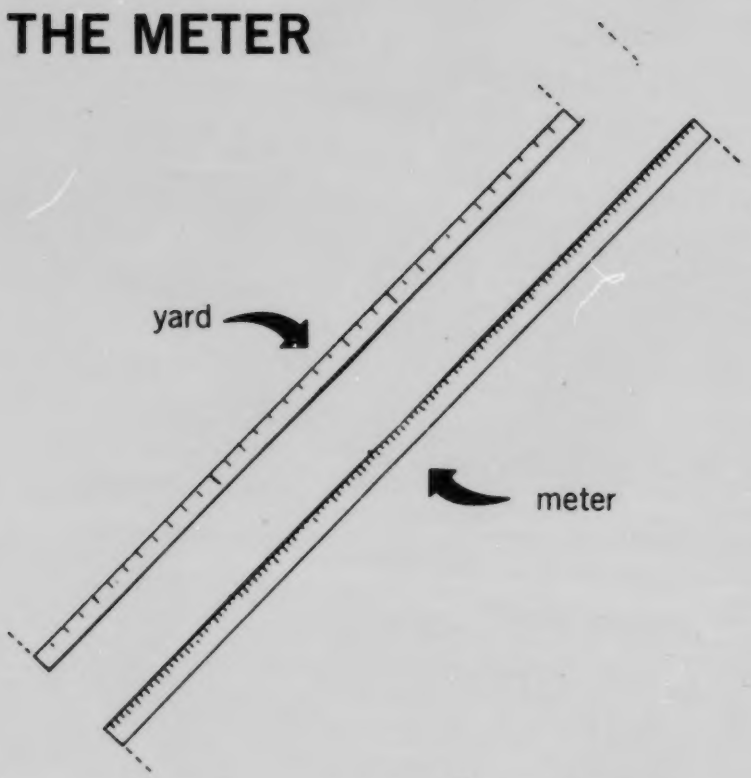
20

UNIT	SYMBOL
meter	m
gram	g
liter	L

PREFIX	SYMBOL
mega-	M
kilo-	k
deci-	d
centi-	c
milli-	m

23

1 THE METER

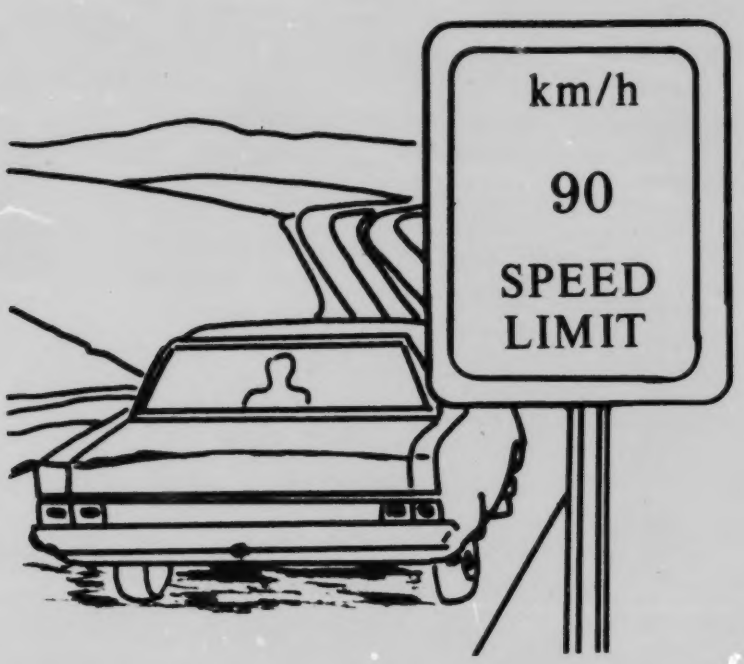


METER
REPLACES

INCH
FOOT
YARD
MILE
FATHOM
ROD
CUBIT
FURLONG
SPAN
ETC.

23

meter x 1 000 = 1 kilometer (km)



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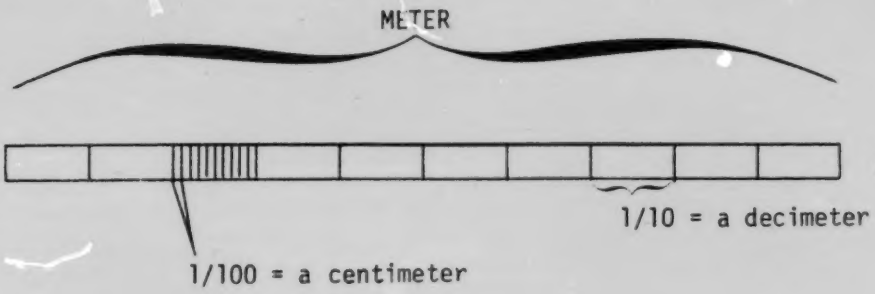
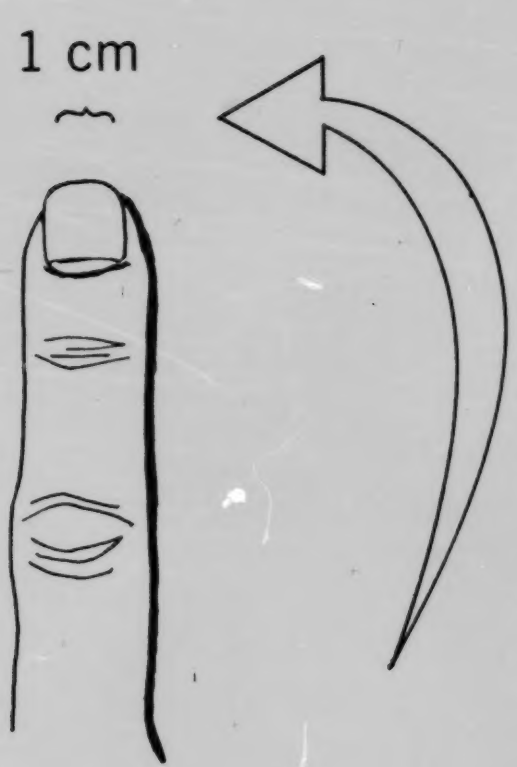
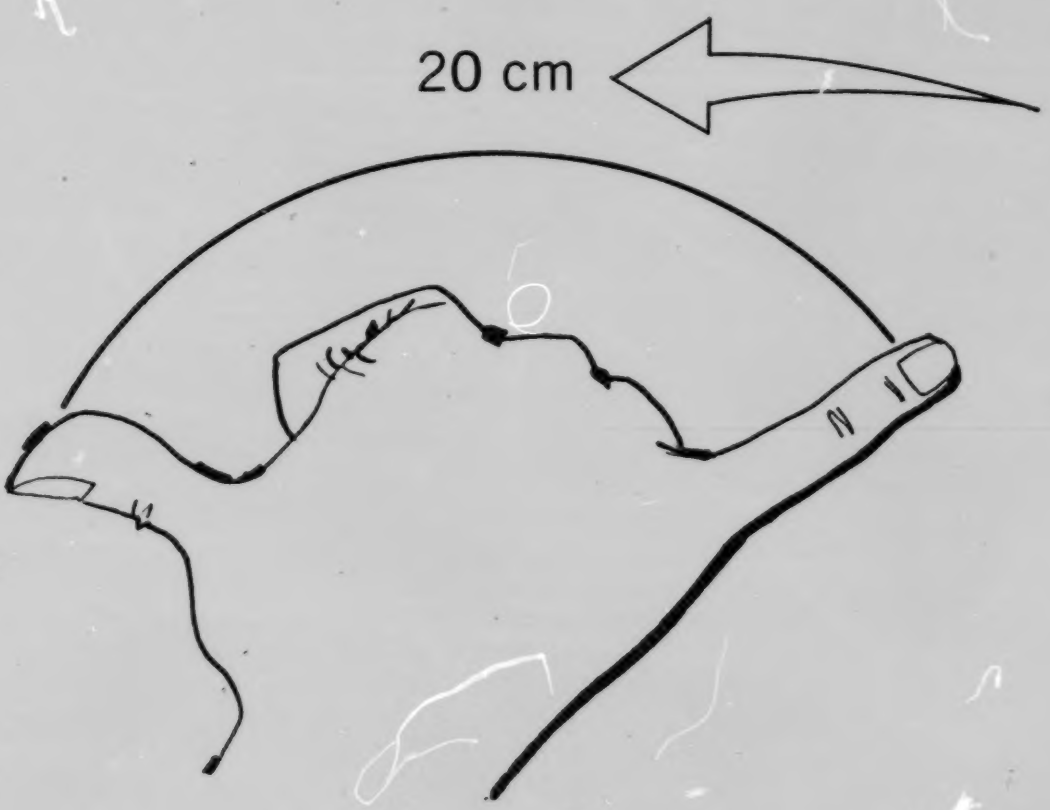


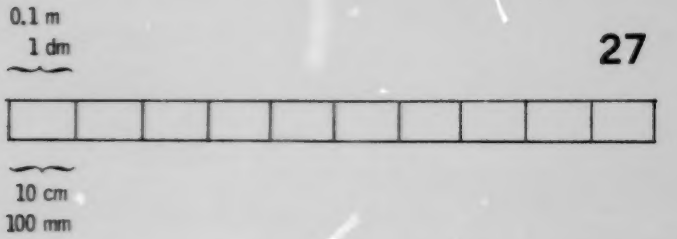
25



26

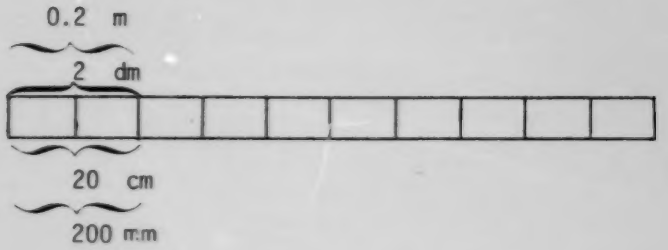


0.1	meter
1.0	decimeter
10.0	centimeters
100.0	millimeters



EXAMPLE:

0.2	meter
2.0	decimeters
20.0	centimeters
200.0	millimeters



PROBLEM:

	0.4	meter
	4.0	decimeters
=	_____	centimeters
=	_____	millimeters

ANSWERS:

	.4	meter
=	4	decimeters
=	40	centimeters
=	400	millimeters

REMEMBER WHEN . . .

	1/4	yard
=	3/4	foot
=	9	inches

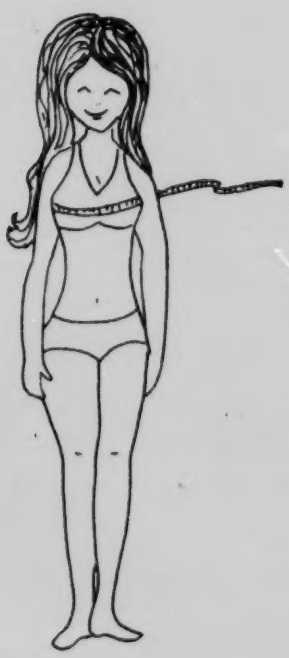
31

36 inches

3 feet

1 yard

32



0.91 meter

9.1 decimeters

91 centimeters

910 millimeters

35

33

REVIEW:

meter x 1 000 = _____

0.1 or 1/10 meter = _____

0.01 or 1/100 meter = _____

0.001 or 1/1 000 meter = _____

34

ANSWERS:

meter x 1 000 = kilometer

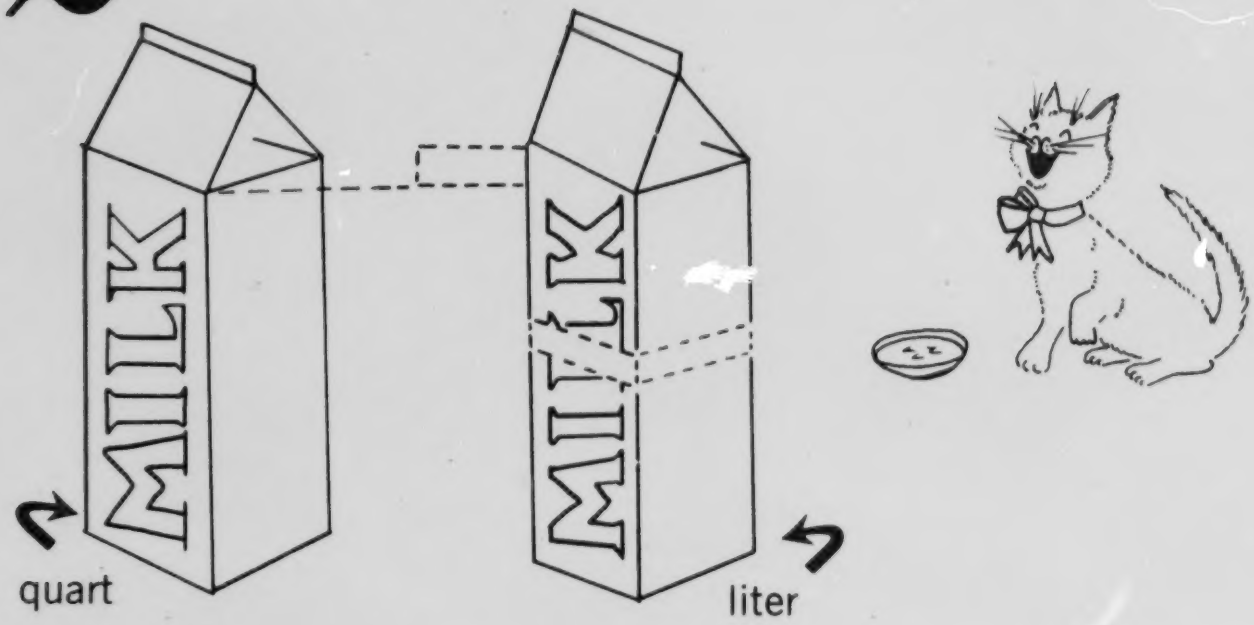
0.1 or 1/10 meter = decimeter

0.01 or 1/100 meter = centimeter

0.001 or 1 000 meter = millimeter

THE LITER

35



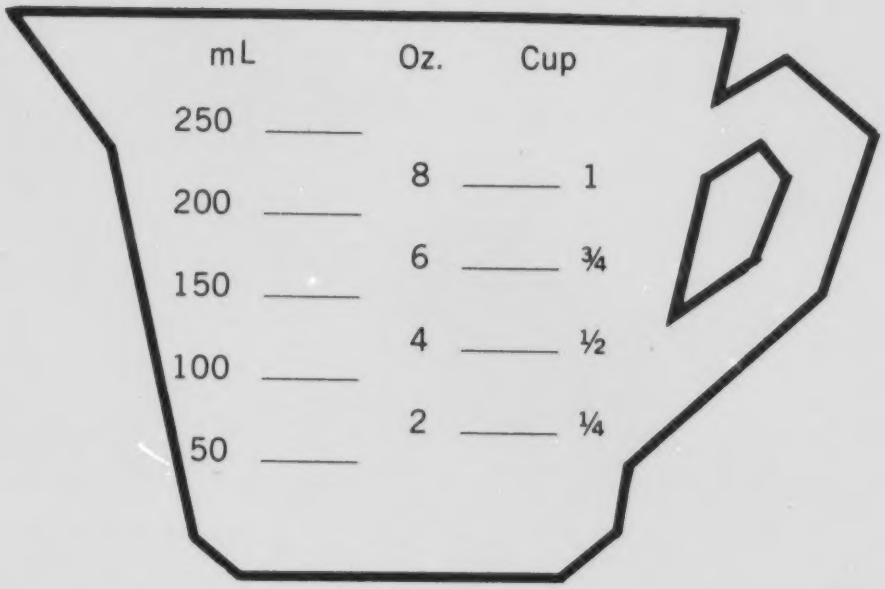
36

LITER
REPLACES

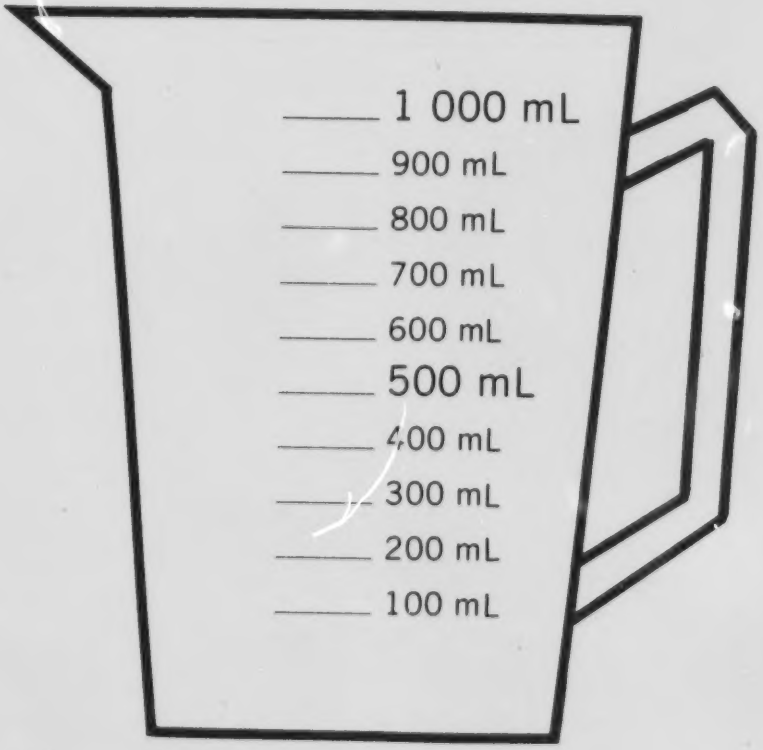
QUART
GALLON
FLUID OUNCE
ETC.

37

37

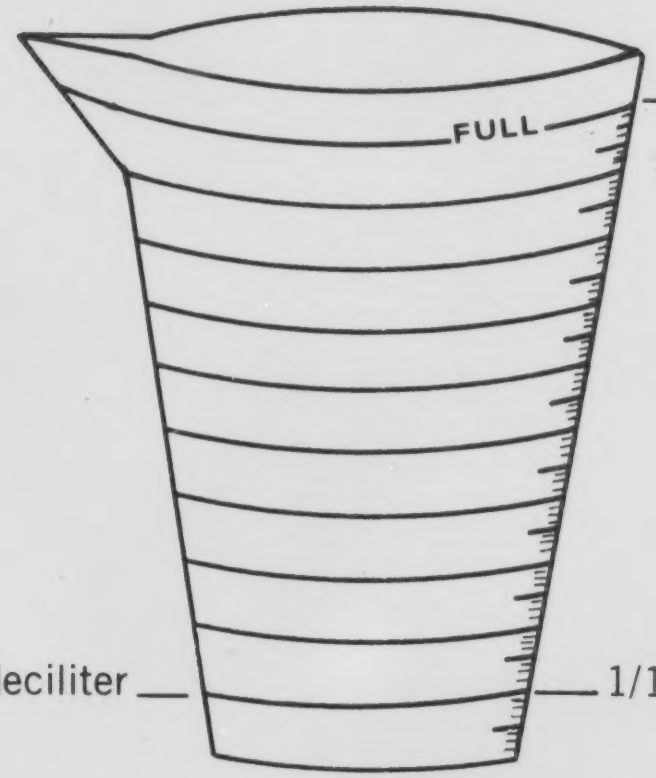


38

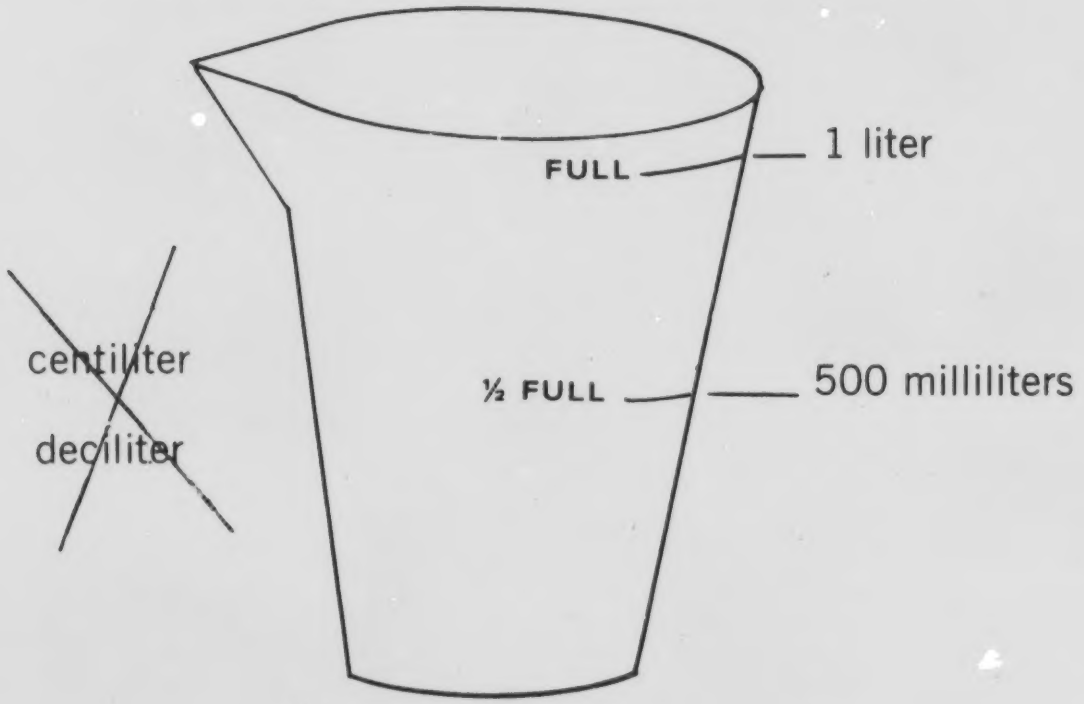


1 liter or
1 000 milliliters

39


1 liter
FULL
1/10 = 1 deciliter
1/10 = 10 centiliters

40

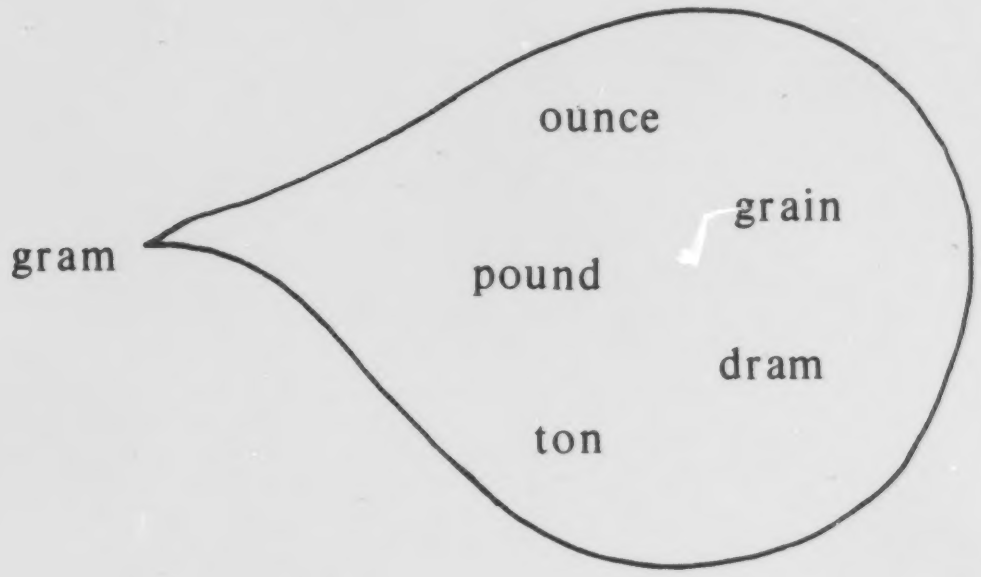

1 liter
FULL
½ FULL
500 milliliters
centiliter
deciliter

3

GRAM

. . . for mass

or weight



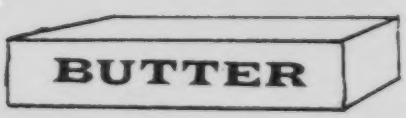
43

1 000 grams = 1 kilogram

1 000 g = 1 kg

44

1 kilogram



1 pound

45

80 kg

46

80 kg

?

80 kg

HINT: 1 kg = 2.2 pounds

47

QUICK GUESS =

160+ pounds

ACTUALITY =

176 pounds

48

REVIEW:

We metrically measure . . .

length by using the _____ ,

volume, or liquid, by using the _____ ,

and mass, or weight, by using the _____

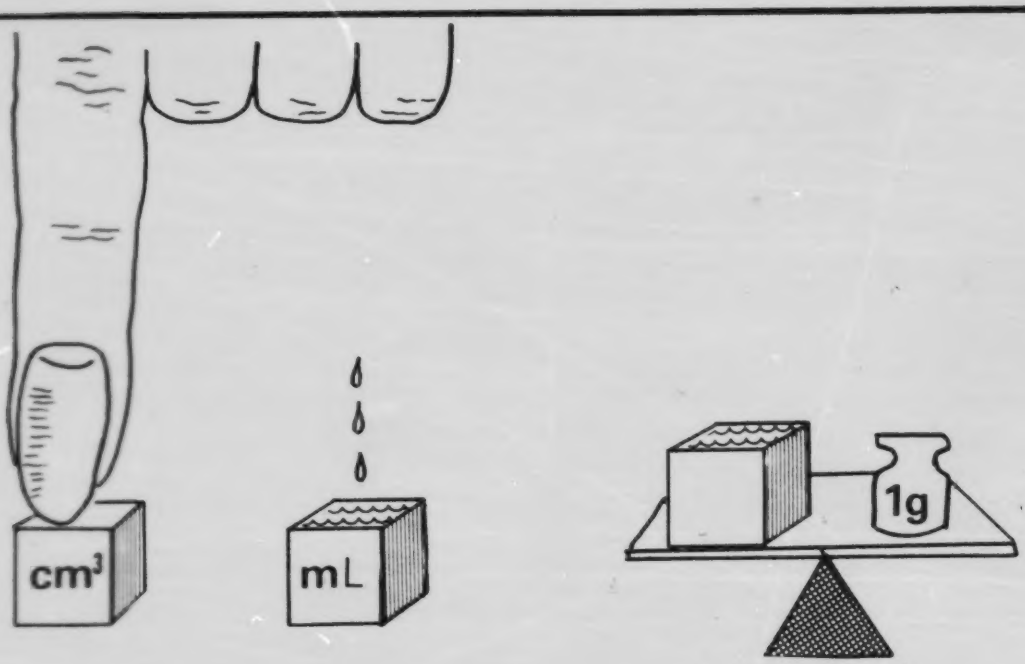
or _____ .

49

ANSWERS:

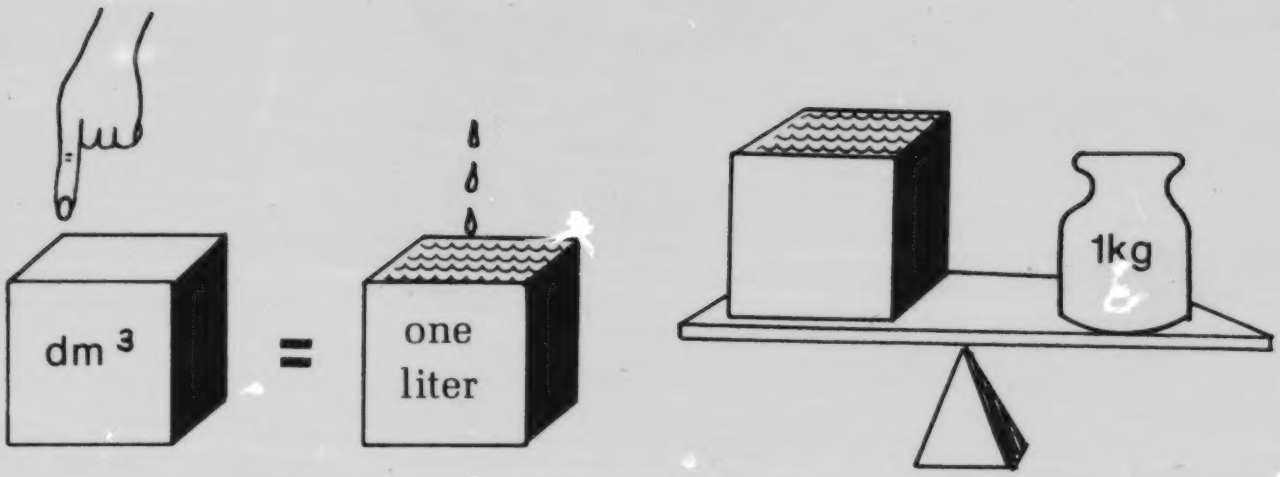
We metrically measure . . .
length by using the *meter,*
volume, or liquid, by using the *liter,*
and mass, or weight, by using the *gram*
or *kilogram.*

50



1 cubic centimeter = 1 milliliter = 1 gram of water

51



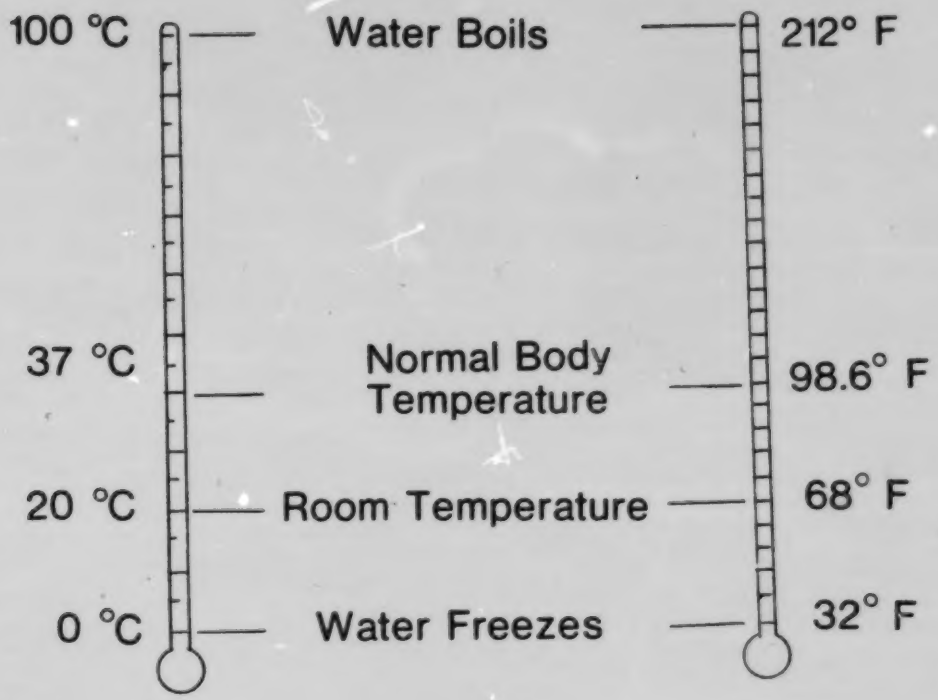
1 cubic decimeter = 1 kilogram of water

52

4

CELSIUS

53



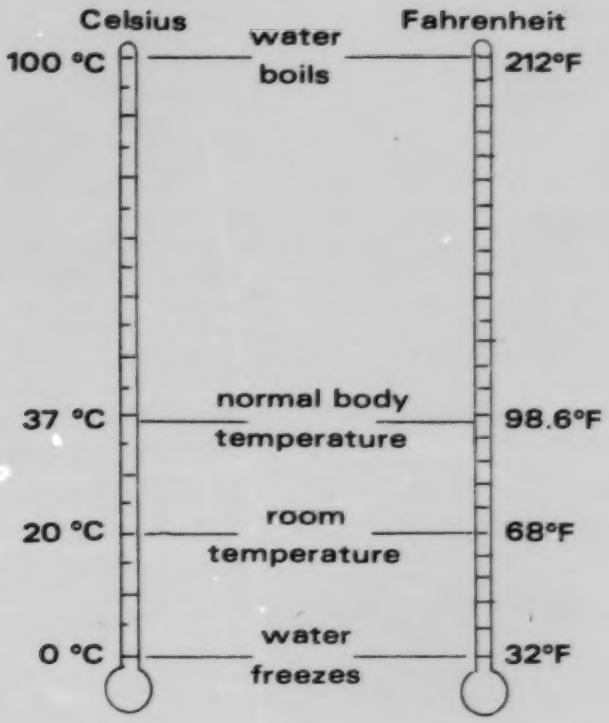
54

37 °Celsius

= Normal temperature

(or 98.6° Fahrenheit)

55


Celsius
Fahrenheit
100 °C
water boils
212°F
37 °C
normal body temperature
98.6°F
20 °C
room temperature
68°F
0 °C
water freezes
32°F

56

5 JOULE

57

A diet with a caloric value of 2,000

is approximately equal to a diet with an

energy value of 8 000 kilojoules.

Ratio:	1:4	approximately
	1:4.2	actuality

58

59

BASIC UNITS

PREFIXES

RULES

60

NO: ~~14 cm.~~

YES: 14 cm

USE NO PERIODS AFTER SYMBOLS AND ALWAYS LEAVE A SPACE BETWEEN THE NUMBER AND THE METRIC SYMBOL.

61

NO: ~~14 cms~~

YES: 14 cm

NEVER USE AN "S" AFTER A SYMBOL.

62

NO: ~~14 CM~~

YES: 14 cm

THE SYMBOLS SHOULD BE IN LOWERCASE EXCEPT FOR THOSE DESIGNATED.

(However, yes to: C for Celsius and L for liter.)

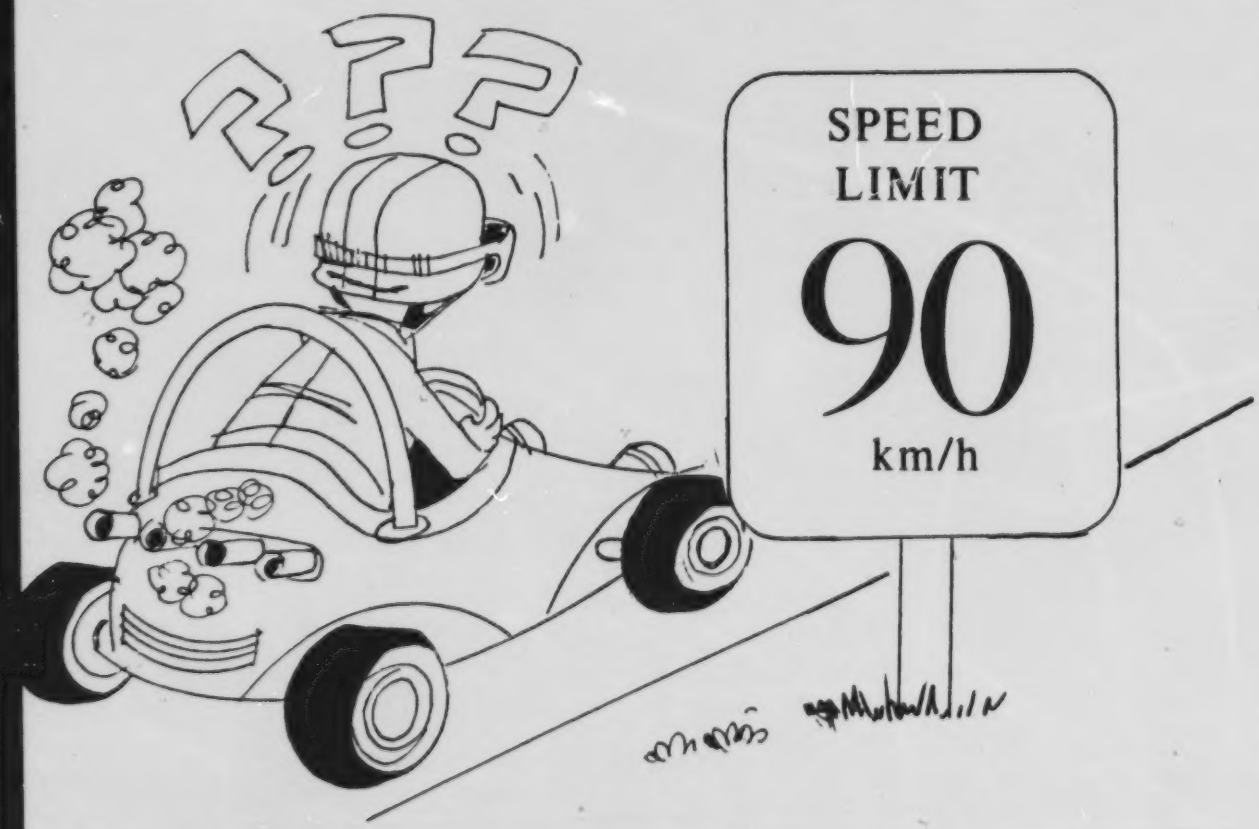
63

NO: ~~14,000~~ km

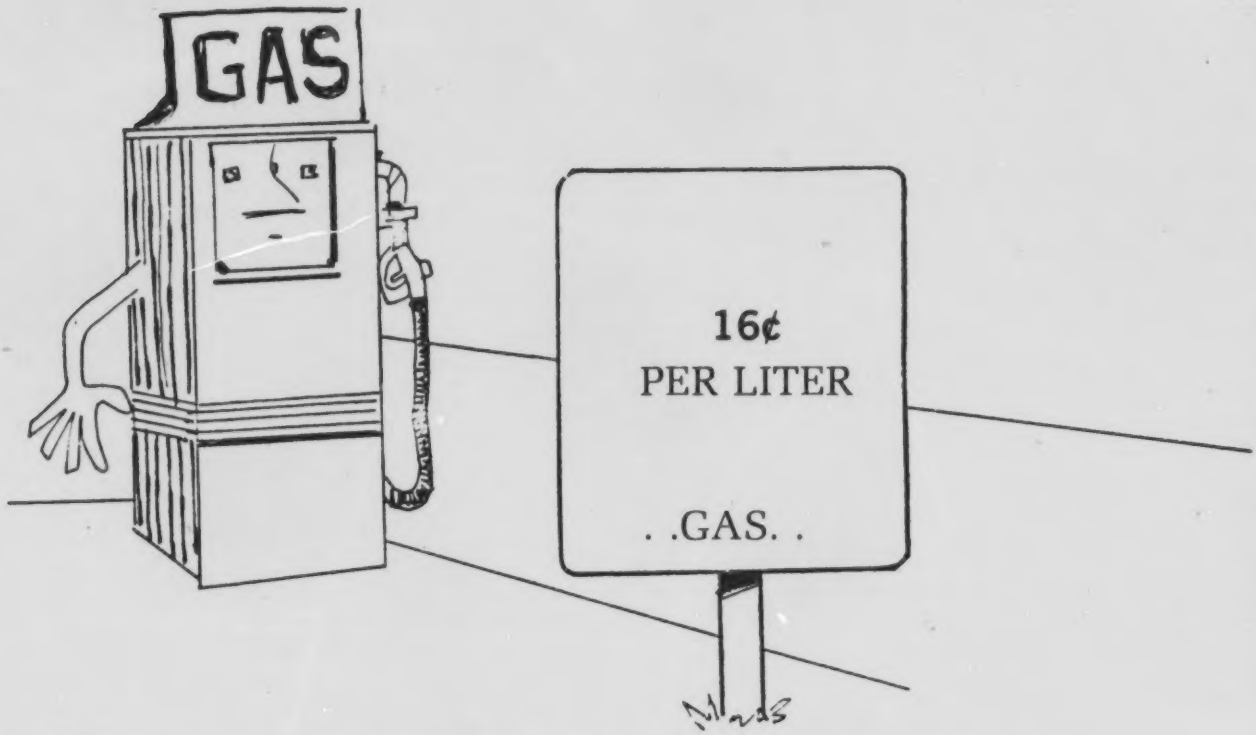
YES: 14 000 km

COMMAS SHOULD BE OMITTED IN FIGURES REPRESENTING LARGE AMOUNTS.

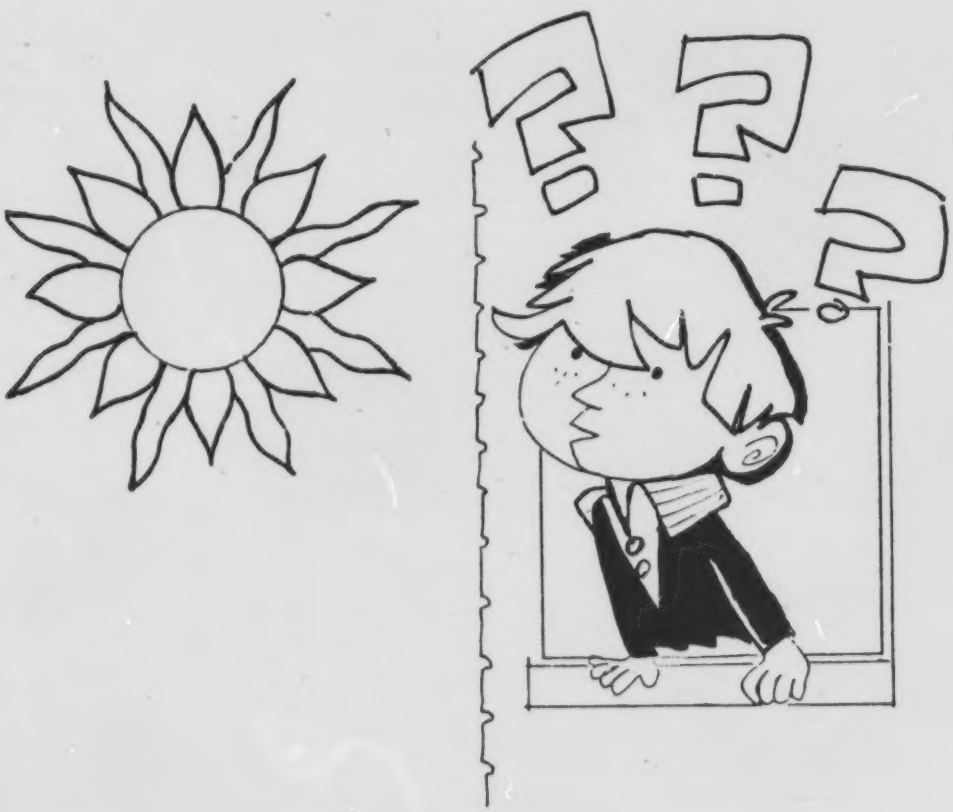
64



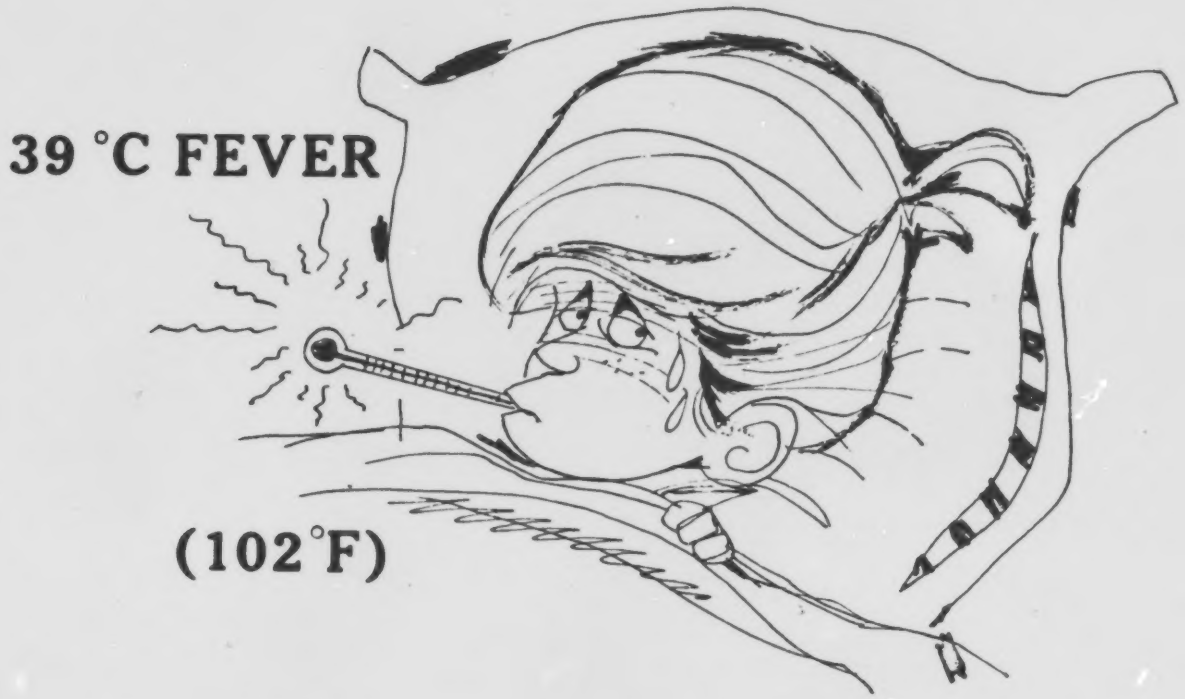
65



66



67



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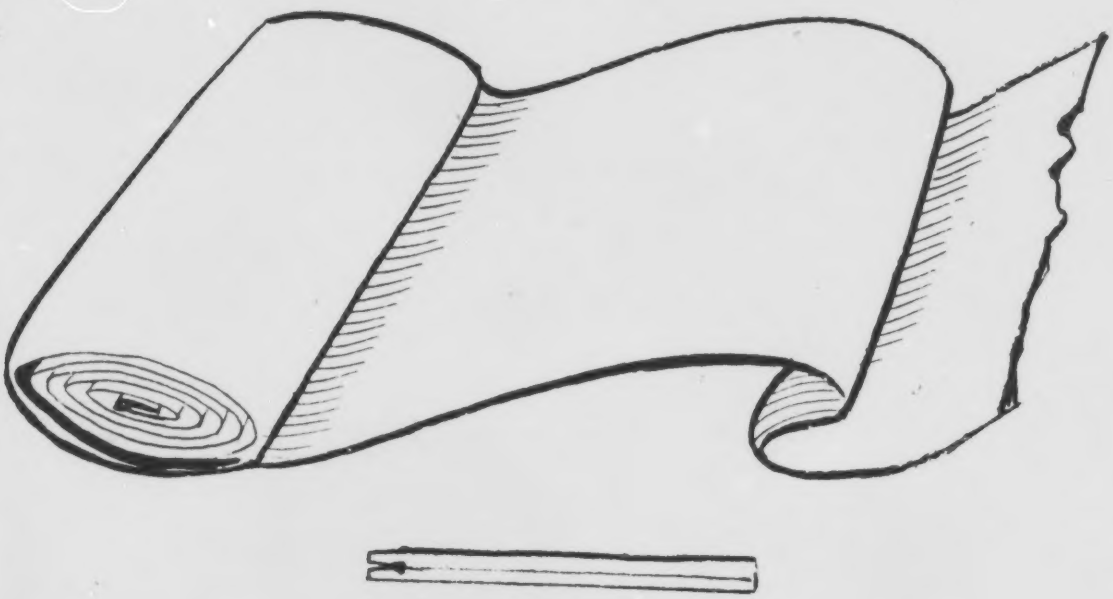
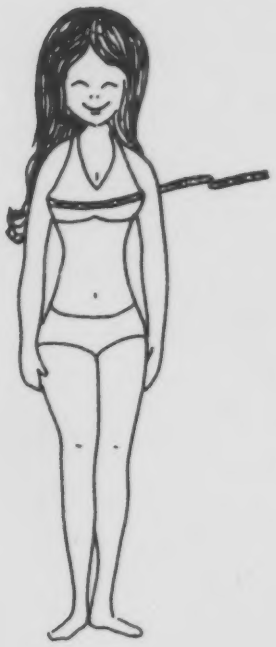


69



BUST	87 cm
WAIST	65 cm
HIPS	92 cm

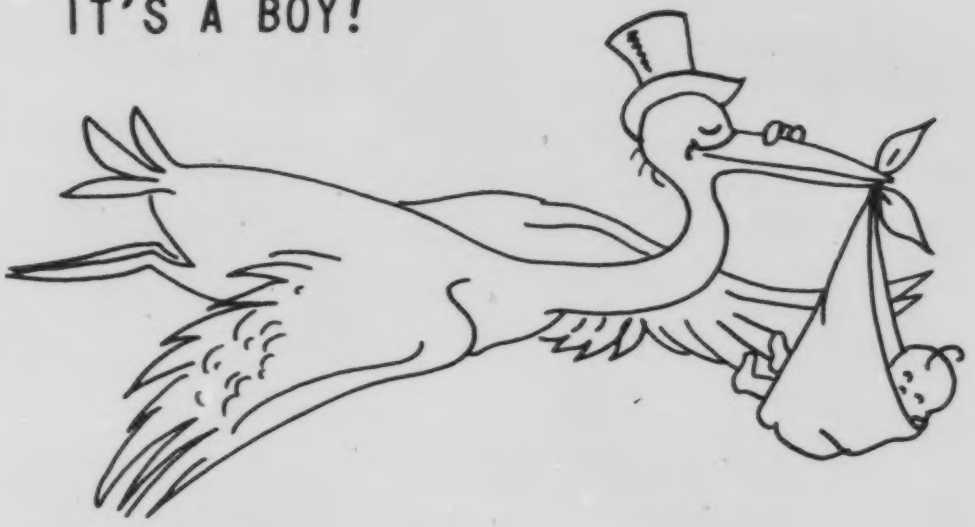
70

100 kilograms

50 kilograms

71

IT'S A BOY!



WEIGHT: 3.1 kg

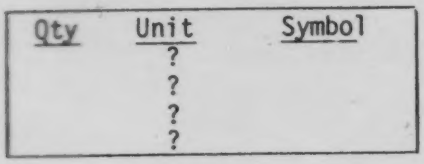
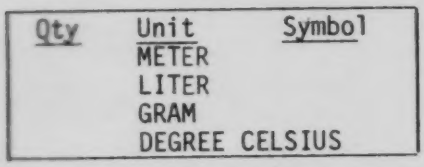
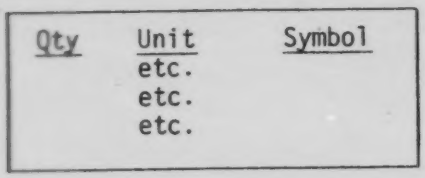
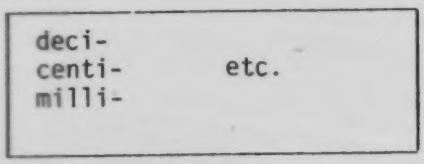
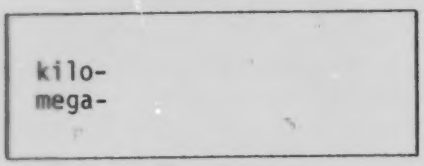
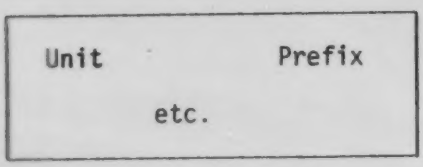
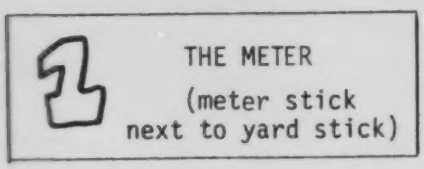
LENGTH: 49 cm

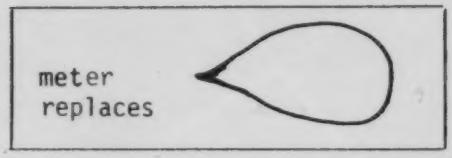
72

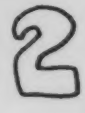
Happy metrication!

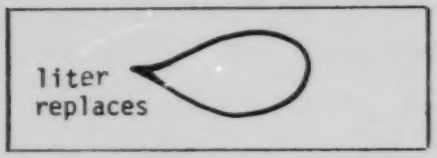
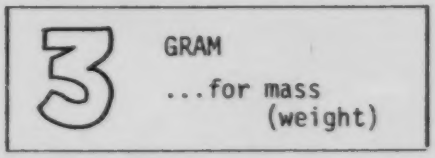
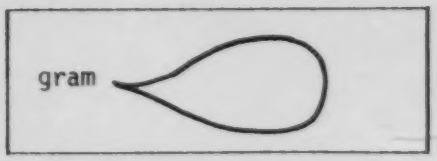
Transparency Miniature	Narration	
SI...Système International or International System of Measurements	SI is the official system of metric measurement that will be used by the United States. The "Système International de'Unites" or International System of Units was officially adopted in France in 1795.	1
(world map)	The United States is the last large country in the world to commit itself to convert to the metric system of measurement.	2
(Ford Pinto)	The United States has long been going metric. Many industries have already converted. The 1974 Ford Mustang and Pinto engines were metrically scaled. The 1976 Chevette is totally metric.	3
(film)	Film has long been measured metrically: 35-millimeter film, 16-millimeter film, and 8-millimeter film (Super 8).	4
(restaurant/wine)	We often order house wine in a restaurant by the liter or half liter.	5
(runner)	Sports enthusiasts should now be very aware of the 100-, 200-, or 400-meter track races.	6
(swimmer)	Or, the 100-meter swim event.	7

	Transparency Miniature	Narration
8	(newspaper article)	We often read in the newspaper about the narcotics officers confiscating a "kilo" (meaning kilogram) of marijuana.
9	(pills and containers)	The pharmaceutical industry has used the metric system for years.
10	(glass of milk with nutritional value listed)	...and dietitians and home economists have been measuring in the metric system the food value and adequacy of daily diets. Every morning you can read the listing of nutrients in grams and milligrams on the back of your cereal box!
11	(metric bill)	In December of 1975, President Ford signed the Metric Conversion Act of 1975. The law declares a national policy of coordinating the increasing use of the metric system in the United States and to establish a U. S. Metric Board to coordinate the voluntary conversion to the metric system.
12		The consumer will be the affected group offering the most resistance to metrics as direct benefits are difficult to assess. The program presented here is designed to provide positive feelings toward metrics for the consumer.
13	Now, let's get ready to... GO METRIC!	Now, put on your thinking hats . . . and let's get ready to GO METRIC!
14	Qty Unit Symbol METER LITER GRAM DEGREE CELSIUS	The consumer will only have to become familiar with four of the basic units. The meter, liter, gram, and degree Celsius. Study this for a moment. (Hold and review with students.)

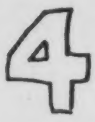
Transparency Miniature	Narration	
	How well do you already know the four basic units? Test yourself. Can you fill in the blanks?	15
	Did you know all the answers? Check yourself.	16
	A mathematician or scientist would need to know a few more metric units. The consumer, however, would rarely use these. (Study this for a moment.)	17
	To more fully understand the metric system we also need to learn some prefixes. Here are the most common prefixes that are added on to the basic units to make them smaller or divide them into portions. (Hold and study with class.)	18
	Here are the most common prefixes that are added on to the basic units to make them larger, or to multiply them into larger portions. (Hold and study with class.)	19
	Here is the total metric language for the consumer's use. (Hold and study.) ...now let's look at one unit at a time.	20
	The meter is slightly larger than a yard. (The meter actually is 39.37 inches long.)	21

Transparency Miniature	Narration
22 	The meter will replace conventional measures for length. These are: inch, foot, yard, mile, fathom, rod, cubit, furlong, span, nautical mile, hand, palm, etc.
23 meter X 1 000 = 1 kilometer (speed sign) (km)	The meter X 1 000 is called a kilometer.
24 (meter divided into parts)	1/10 of a meter is called a decimeter. 1/100 of a meter is a centimeter. 1/1 000 of a meter is a millimeter. (Hold and review with class.)
25 (finger)	As a point of reference, note that the width of your fingernail is approximately one centimeter.
26 (hand span)	Note, also, the approximate span of your hand from the end of your thumb to the end of the little finger is approximately 20 centimeters — if you are an average-sized high school student.
27 0.1 meter 1.0 decimeter 10.0 centimeters 100.0 millimeters	We can easily change from one unit to another by multiplying or dividing by 10, 100, or 1000.
28 Problem: 0.4 meter 4 decimeters ? centimeters ? millimeters	Can you answer this problem? (Answers are 40 cm and 400 mm.)

Transparency Miniature	Narration	
Answers to the problem: 0.4 m 4 dm 40 cm 400 mm	Here are the answers.	29
1/4 yard = 3/4 foot = 9 inches	Remember when we easily converted 1/4 yard to equal 3/4 foot to equal 9 inches? Or... did we ever bother?	30
(girl with 36-inch bustline)	Conventionally, we referred to body measurements by the inches. Did we ever say, "She has a yard bustline"? Or, did we say, "She has a 3-foot bustline"?	31
(girl with ?? bustline)	In the metric system, the centimeter would be the most common unit used in body measurements.	32
meter x 1 000 = ? 1/10 meter = ? 1/100 meter = ? 1/1 000 meter = ?	Let's review the meter. (Hold and read through chart.)	33
= kilometer = decimeter = centimeter = millimeter	Here are the common measures of length. (Hold and read through chart.)	34
 THE LITER (liter next to a quart)	Our second unit of measure will seem easier. Let's look at the liter. The liter is slightly more than a quart. (Just enough more to provide a saucer of milk for kitty, about ¼ cup.)	35

	Transparency Miniature	Narration
36		The liter will replace the quart, gallon, fluid ounce, bushel, peck, gill, barrel, etc.
37	(measuring utensil)	While we are converting to the metric system, the household measuring utensil may look something like this.
38	(liter divided into sections)	The liter will be divided into 1 000 parts called milliliters.
39	(liter container)	The liter could be divided into 10 parts and called deciliters and 100 parts and called centiliters.
40	(liter container)	These units will be very uncommon however. The terms to remember when measuring volume are LITER and MILLILITER.
41		Our third unit of measure will be the gram. This is used for mass -- or weight.
42		The gram replaces the ounce, pound, ton, grain, and dram.

Transparency Miniature	Narration	
1 000 grams = 1 kilogram	The gram is rather small, so we generally refer to the kilogram (1 000 grams).	43
(one pound of butter and one kilogram of butter)	One kilogram weights slightly more than two pounds. (Actually 2.2 pounds)	44
(lady on scale smiling)	Hey, this is great! I weigh only 80 kilograms!	45
80 kg? ??? 80 kg? hint: 1 kg = 2.2 pounds	Wait a minute! If a kilogram is slightly more than double a pound, about how much does this lady weigh in pounds?	46
(lady on scale frowning) 176 pounds	Quick guessing would give us 160+ pounds. In actuality, she would weigh 176 pounds.	47
We metrically measure...	Let's review what we have learned so far. Fill in the blanks.	48
We metrically measure...	How did you do? (Hold and review with class.)	49

	Transparency Miniature	Narration
50	(picture of related meter, liter, and gram)	The three units that we have just learned (meter, liter, and gram) are all related to each other in a very special way. 1 cubic centimeter = 1 milliliter and when filled with water weighs 1 gram.
51	(larger portions related)	Or, 1 cubic decimeter = 1 liter and when filled with water weighs 1 kilogram. (If possible, the teacher can stop here and demonstrate this fact with a clear plastic decimeter cube.)
52	 (thermometer)	The fourth metric unit that we will learn is the degree Celsius for temperature.
53	(2 thermometers: one Celsius, one Fahrenheit)	You may formerly have known this as the Centigrade temperature. Freezing is 0 degrees and boiling is 100 degrees. The Celsius thermometer is divided into 100 degrees from 0 to 100. This is much easier to remember than 32 degrees Fahrenheit for freezing and 212 degrees Fahrenheit for boiling!
54	(child with thermometer)	Normal body temperature is 37 degrees Celsius! (Remember 98.6 Fahrenheit?) A concern of the consumer should be that a fever of one degree Celsius would be much more serious than a fever of one degree Fahrenheit!
55	(thermometer with labeled temperatures)	We will just have to become familiar with the different temperatures. For example, our normal body temperature is 37 degrees Celsius; a comfortable room temperature would be 20 degrees Celsius; and a warm, sunny beach day might be 25 degrees Celsius.
56	JOULE	One additional metric unit of measure with which the consumer should be familiar is the joule (pronounced like "jewel").

Transparency Miniature	Narration	
A diet with a Caloric value of 2,000 is approx equal to a diet with an energy value of 8 000 kilojoules. Ratio: 1:4 approx. Ratio: 1:4.2 actually	The joule in the International System of Units would replace the Calorie. (Hold and review with class.)	57
(picture of fat person stuffing self with R_x note for 4 000-kilojoule diet.)	When dieting, don't get carried away when told to use a 4 000-kilojoule diet! This is the same as a 1 000 calorie diet.	58
Basic Units Prefixes Rules	We now know the basic units of the metric system and the prefixes. Now we must learn some rules in writing metrics.	59
NO: ~~14 cm.~~ YES: 14 cm	First of all, use no periods after the symbols and always leave a space between the number and the metric symbol.	60
NO: ~~14 cms~~ YES: 14 cm	When writing plural measurements, never use an "s" after the symbol. The number itself indicates that it is plural.	61
NO: ~~14 CM~~ YES: 14 cm HOWEVER YES TO: C for Celsius and L for liter	The symbols should be in lowercase except for those designated.	62
NO: ~~14,000 km~~ YES: 14 000 km	Commas should be omitted in figures representing large amounts, as the comma in some countries is interpreted as a decimal point. Instead, we should leave a space.	63

	Transparency Miniature	Narration
64	(speed sign 90 km/hour)	How will all this affect us? Can you imagine going 90 km/hour on the highway?
65	(gas 16¢/liter)	Can you imagine paying only 16¢ a liter for gas? Yes, you will quickly adapt to this when you find that your 16 gallon tank now holds over 60 liters.
66	(bright, sunny day--person looking through window with ????)	Can you imagine the weatherman saying, "Enjoy your sunny, warm 25-degree weather tomorrow"?
67	(sick person)	Can you imagine the doctor saying, "You have a temperature of 39 degrees Celsius! You're really sick."
68	(fabric and zipper)	Can you imagine buying 2 meters of fabric and a 20-centimeter zipper for your new dress?
69	(picture of girl)	Can you imagine having slim body measurements of 87-65-92?
70	(picture of boy and girl)	Can you imagine weighing only 50 kilograms?

Transparency Miniature	Narration	
(baby announcement)	Can you imagine receiving a birth announcement reading: New Baby Boy Weight: 3.1 kilograms Length: 49 centimeters	71
HAPPY METRICATION!	HAPPY METRICATION!	72

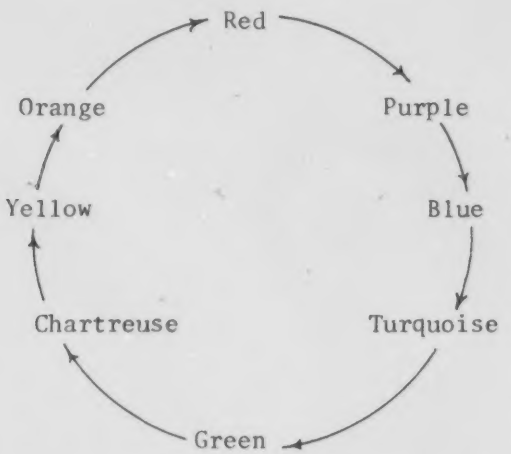
IV. LEARNING TO USE METRIC UNITS

LEARN-BY-DOING WORKSHOP

These workshops are intended to give the students "hands-on" experience in using metric measurements. A student who completes all of the workshops will have had experience with all the common metric units of measurement.

Place the supplies and equipment for each of the workshops at a convenient place with enough workspace to complete the tasks included. Mark each of these "stations" with a color as shown on the color wheel below and the pages following this one. Distribute the students among the stations by giving them colored tags to show which station each one starts at. When a student finishes the tasks at one station he or she moves clockwise to the next one.

Directions for the students are given on the following station sheets. They are to fill the blanks on each page as they go through the tasks. You may then have them turn in these pages to you, if you wish.



Red Station: Body Measurements

Supplies and equipment at the station:

Metric tape measures (several)
Metric height chart on wall
Metric bathroom scale
Metric Body Measurement Chart
(From section of this book
"Metrics and Clothing.")

1. Using the appropriate equipment, take your measurements and fill in the blanks on the lines below and in the right-hand column of the table.

I am _____cm tall.

_____ m tall.

Examples:
I am 164 cm tall.
1.64 m tall.

2. My bust (or chest) measurement is _____mm, or _____cm, or _____m.

   Which of these three figures is most convenient to use?_____

3. Have you ever considered using the term a "3-foot bustline" or a "1-yard bustline"? _____

4. Estimate the height of the person next to you. _____cm

   Now, measure to see how close you were.

   Actual measurement was: _____ cm

   How far off was your estimate? _____ cm

WORKSHOP SHEETS

Purple Station: Volume

Supplies and equipment at the station:

- 3 metric measuring beakers
- 1 full, capped cola bottle
- 3 empty cola bottles
- 1 1-liter wine flask
- 1 large container with "?" on it
- 1 tea cup
- 1 drinking glass
- 1 large container for water (or a sink)

1. Fill a measuring beaker with 100 mL of water. Pour this into the empty cola bottle.

   Now estimate with your eye how many mL in a full cola bottle: _____ mL

2. To check your estimate, fill the empty cola bottle with water to the same level as a full, capped bottle. Pour the water into a beaker to measure its volume.

   What is the volume content of the cola bottle? _____ mL

   How far off was your estimate? _____ mL

3. Put water in a tea cup and decide what amount in mL should be used for a typical serving of tea. Use whole numbers.

   An average tea cup serving is: _____ mL

4. In the same way, decide upon an amount which could be used for a glass of water. Use whole numbers.

   An average drinking glass serving is: _____ mL

5. Fill the wine flask with exactly one liter.

   By visualizing what one liter "looks like," estimate the contents of the large container marked "?".

   Write your estimate here: _____ mL

Blue Station: Weighing Food

Supplies at the station:
1 metric scale
1 bag of potatoes
1 banana

1. Approximately how many potatoes are in 1 kg? (Use the scale to determine this.) _____

2. What is the average weight of one potato? (Hint: Weigh 3 potatoes and divide by 3.) _____ g

3. At the grocery store the potatoes are marked:

Potatoes 20¢/kg

At this price, how much would 500 g of potatoes cost? _____ ¢

How much would 250 g cost? _____ ¢

Weigh 6 potatoes. Approximately how much would they cost?
weight: _____ g
cost: _____ ¢

4. How much does one banana weigh? _____ g

5. Estimate how many bananas it would take to weigh 1 kg. _____

Turquoise Station: Package Labeling

Supplies and equipment at the station: Miscellaneous grocery items marked in customary and metric units

1. Look at the grocery items. The quantities are given in customary and metric units. Classify the groceries as solid, liquid, or semi-solid. What metric measurement units are used on them?

Grocery Item	Solid	Liquid	Semi-solid	Metric Unit Used

2. Have you found any errors in the quantities or symbols shown on the labels of grocery items? If so, record them below,

_____ should have been _____ on the container of _____.

_____ should have been _____ on the container of _____.

_____ should have been _____ on the container of _____.

_____ should have been _____ on the container of _____.

_____ should have been _____ on the container of _____.

Green Station: Garment Construction

Supplies and equipment at the station: 1 pattern envelope (with metric measurements)
1 pattern piece

1. What is the metric seam allowance on the pattern piece? _____cm

   Had you ever noticed that designation on a pattern before? _____

According to the pattern envelope, answer the following questions:

2. The metric unit for measuring length is the _____.

3. What are the body measurements for a misses size 12?

   Bust _____cm, Waist _____cm, and Hips _____cm

4. What are the standard fabric widths listed?

   _____cm, _____cm, _____cm, and _____cm

5. The finished length of the pants at the side seam of a misses size 10 would be

   _____cm

6. For a misses size 12 you would need _____ cm of 1.3-cm wide elastic.

Chartreuse Station: Length

Supplies and equipment at the station: 1 cookie sheet
3 meter sticks

1. Make your own "body rule," as follows:

   Which of your fingernails is about 1 cm wide?

   How long is the span between the end of your thumb and the end of your little finger? _____ cm

   Extend your arm out. Then start from the tip of your middle finger and measure one meter back along your arm. To what point on your body does the end of the meter reach?

   _____ To your nose (facing forward)?
   _____ To the ear opposite your extended arm?
   _____ To the shoulder opposite your extended arm?
   _____ Other (Specify.) _____

   Measure the length of your pace. (A pace is two steps.) Measure from the back of your heel to the back of the same heel at the end of the pace. Your pace is _____ cm

2. Using your "body rule," estimate the size of the cookie sheet.

   _____ cm x _____ cm

3. Using the meter stick, measure the working height of a table where you would be sitting. _____ cm

4. What is the height of the seat of a chair? _____ cm

5. Measure the height of a counter. _____ cm

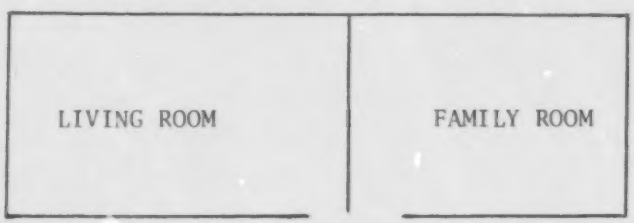
6. The following floor plan has a scale of 1 cm = 1 m.

   What are the dimensions of the living room?

   _____ m x _____ m

   How many square meters of carpet would you order for the family room?

   _____ m^2



Yellow Station: Temperature

Supplies at the station:

- 12 disposable coffee cups
- 1 container for waste water
- 5 thermometers (each with a range of -10°C to 110°C)
- 1 bowl of ice water
- 1 pan of hot water (not too hot to touch)

1. Record the temperature of the ice water. Feel it with your fingers. _____°C

2. Record the temperature of the hot water. _____°C

3. Pour some hot water and some cold water together into a cup. Feel it. Estimate the temperature. Record. _____°C
   Now measure the temperature to see how close you were. _____°C

4. Repeat No. 3, using different amounts of hot and cold water.
   Your estimate of the temperature. _____°C
   The measured temperature. _____°C

Orange Station: Accuracy of Metrics

Supplies at the station:
- 2 metric scales
- Flour
- 2 sets of dry measuring cups
- 2 sifters
- 2 metal spatulas
- Wax paper
- 1 dampened dish cloth
- 2 large spoons

1. Measure and weigh 1 cup of flour by the following methods:
   (a) Scoop flour out of canister with measuring cup, level it off, and weigh it on a metric scale.

   1 cup unsifted flour weighs _____ g

   (b) Sift flour onto wax paper, spoon lightly into the cup, level, and weigh.

   1 cup sifted flour weighs _____ g

   (c) Sift flour directly into the cup (hold over a piece of wax paper to catch spillage), level, and weigh.

   1 cup directly sifted flour weighs _____ g

2. Did the three measurements differ in weight? Find the difference between the lowest and the highest weights.

   Highest weight _____ g
   Lowest weight _____ g
   Difference _____ g

3. Compare the results of method 1(b) with measurements obtained by other participants:

   Participant 1: _____ g
   Participant 2: _____ g
   Participant 3: _____ g

   Find the difference between the lowest and highest values. _____ g.

4. How accurate is measuring ingredients by volume? _____

5. How accurate is measuring ingredients by mass (or weight)? _____

6. Were there any major difficulties in using the scale? _____

Metric Posttest

Answer the following questions without any aids the first time through. Then, consult your workshop papers to aid you in answering.

1. The basic metric unit used in measuring length is the _____.
2. The basic metric unit in measuring mass (weight) is the _____ or the _____.
3. The basic metric unit used in measuring volume (of liquids) is the _____.
4. The metric degree of temperature is called _____.
5. To divide any of the basic units into 100 parts, the prefix _____ is used.
6. To divide any of the basic units into 1000 sections, the prefix _____ is used.
7. To multiply a basic unit by 1000, we use the prefix _____.
8. Driving distance is measured metrically in _____.
9. The approximate span from the tip of *your* thumb to the tip of *your* little finger is _____ cm.
10. Using your "body rule" determine the width of this paper. _____ cm
11. Normal body temperature is _____ °C
12. How much do you weigh? _____ kg
13. How tall are you? _____ cm
14. What is the seam allowance on a pattern? _____ cm
15. What is a comfortable room temperature? _____ °C

V. METRIC UNITS IN FOOD AND CLOTHING

METRICS AND FOOD

The introduction of metric measurement will affect the way food is measured, the way temperatures are set for cooking, and the utensils used. The basic principles of food preparation will not be changed.

This section covers methods of measuring food items in metric units and the kinds of utensils used with metric sizes. Data on Celsius temperatures for cooking are included as are several pages of recipes in metric units.

Measuring Food Items

Volume versus weight in recipes has become a debatable question. American homemakers are accustomed to using volume measurements for both dry and liquid ingredients. This system has been quite satisfactory except for the special needs of dietitians, food testers, and those on special diets. Some problems in volume measuring occur because of inconsistencies in the sifting of flour, the packing of brown sugar, and the removal of bubbles from shortening by pressing into a measure.

Measuring recipe ingredients by weight can solve these problems. An ideal scale will have a deep dish which can easily measure, for example, 100 grams of flour, 30 grams of sugar, and 5 grams of baking powder, totaling 135 grams. These dry ingredients can be mixed in this dish together with the liquid ingredients. Then only two containers would need to be cleaned.

The following guidelines are suggested.

1. Continue to use volume measures in cooking and measure food items in liters and milliliters. Volume measures not recommended are: dekaliter, deciliter, centiliter, and fractions of a liter.

Examples Recommended:	Examples Not Recommended:
500 milliliters or 0.5 liter	1/2 liter or 5/10 liter
200 milliliters or 0.2 liter	2 deciliters

2. In recipes calling for food ingredients by mass (or weight) as for meat and bulk produce, use gram and kilogram. Units not recommended for use are dekagram and centigram. Milligrams are already in common use for designating the nutrient content of food and should be continued.

We recommend also that students not change units of measurement in a recipe from customary units to metric or vice versa. That is, if a recipe is in customary units, they should follow the recipe using customary utensils and measurements. If the recipe is in metric units, they should use metric utensils and measurements.

The tables and other information on the following pages will be helpful in preparing food. Included are:

Oven Temperatures
Meat Temperature Guide
Units for Volume Measurement
Standard Sizes of Utensils
Metric Recipes

OVEN TEMPERATURES AND OTHER USEFUL TEMPERATURES

	Degrees Fahrenheit	Degrees Celsius (Rounded)
	175	80
	200	95
	212	100
	225	110
Oven Setting		
Very slow	250-275	120-135
Slow	300-325	150-165
Moderate	350-375	175-190
Very hot	400-425	200-220
Broil	450-475	230-245
	500-550	260-290

MEAT TEMPERATURE GUIDE

Meat	Degree of Doneness	Degrees Celsius
Beef	rare	60
	medium	65
	well done	75
Lamb	medium	70
	well done	75
Veal	well done	80
Fresh Pork	well done	80
Poultry	well done	85

Units For Volume Measurement

The table below shows the metric equivalents of volume measurements in fluid ounces and other customary units. These figures, however, should be used only as a guide. If you are planning to determine quantities for writing a recipe, be sure to test each recipe at least three times and modify it as necessary, before considering it a completed recipe. Determining a recipe in this way would make a good class project.

CUSTOMARY UNITS		METRIC UNITS
Fluid Ounces	Other Units	Milliliters
	$\frac{1}{8}$ tsp	0.5
	$\frac{1}{4}$ tsp	1
	$\frac{1}{2}$ tsp	2.5
	1 tsp	5
	2 tsp	10
$\frac{1}{2}$ oz	3 tsp or 1 T	15
1 oz	2 T	30
2 oz	$\frac{1}{4}$ cup	60
3 oz		90
4 oz	$\frac{1}{2}$ cup	120
5 oz		150
6 oz	$\frac{3}{4}$ cup	180
7 oz		210
8 oz	1 cup	240
9 oz		270
10 oz	$1\frac{1}{4}$ cups	300
11 oz		330
12 oz	$1\frac{1}{2}$ cups	360
13 oz		390
14 oz	$1\frac{3}{4}$ cups	420
15 oz		450
16 oz	2 cups or 1 pint	480
32 oz	4 cups or 1 quart	960
128 oz	4 quarts or 1 gallon	3 840

80

Standard Sizes Of Utensils
Customary Units and Metric Units

BAKING UTENSILS

UTENSIL	INCHES	CENTIMETERS, ROUNDED
Cake Pan	10 x 1½ high	25 x 15 x 4 high
Oblong	13 x 9 x 2 high	33 x 23 x 5 high
Round	8 diam. x 1½ high	20 diam. x 4 high
	9 diam. x 1½ high	23 diam. x 4 high
	10 diam. x 1½ high	25 diam. x 4 high
Square	8 square x 2 high	20 square x 5 high
	9 square x 2 high	23 square x 5 high
	10 square x 4 high	25 square x 10 high
Tube (For Angel Food Cake)	9 diam. x 4 high	23 diam. x 10 high
	10 diam. x 4 high	25 diam. x 10 high
Pie Pan	6 diam. x 1½ high	15 diam. x 4 high
	8 diam. x 1½ high	20 diam. x 4 high
	9 diam. x 1½ high	23 diam. x 4 high
	10 diam. x 1½ high	25 diam. x 4 high
Cookie Sheet	10 long x 8 wide	25 long x 21 wide
	14 long x 10 wide	36 long x 25 wide
	15½ long x 12 wide	39 long x 30 wide
	16 long x 11 wide	41 long x 28 wide
Jelly Roll Pan	15½ x 10½ x 1 high	39 x 27 x 3 high
Loaf Pan	7½ x 3⅜ x 2⅛ high	19 x 10 x 6 high
	9½ x 5 x 3 high	24 x 13 x 8 high
Muffin and Cupcake Pan	2½ diam. x 1⅛ high	6 diam. x 3 high
	3 diam. x 1½ high	8 diam. x 4 high

OTHER UTENSILS

UTENSIL	CUSTOMARY MEASURE	METRIC MEASURE
Casserole	1 quart	1 liter
Saucepan	1 quart	1 liter
	2 quarts	2 liters
	3 quarts	3 liters

NOTE: Kitchen utensils in metric sizes are available in American stores.

TEA DOUGHNUTS

1 egg
100 mL milk
100 mL sugar
30 mL melted butter
300 mL sifted flour
10 mL baking powder
1 mL salt
1 mL nutmeg
1 mL vanilla

1. Beat egg — add milk — beat.
2. Sift flour, baking powder, salt, and nutmeg.
3. Add sifted ingredients and sugar to egg-milk mixture.
4. Add melted butter and vanilla.
5. Mix well.
6. Heat shortening for frying to 185°C.
7. Drop 5 mL dough into hot fat.
8. Fry 3 to 5 minutes.
9. Makes about 20.
10. Doughnuts may be rolled in powdered sugar, if desired.

DIET DESSERT SUPREME

300 mL nonfat dry milk
500 mL water
2 rennin tablets
2 pkg. Sugar Twin

Flavor Variations

1. Orange Coconut Supreme: Vanilla 10 mL, Orange 5 mL, Coconut 2 mL, Almond 1 mL. Colorings: 1 mL red, 1 mL yellow.
2. Chocolate Almond Supreme: Vanilla 10 mL, Chocolate 10 mL, Almond 2 mL. Colorings: 1 mL red, 1 mL yellow, 1/2 mL green.
3. Lemon Fluff: Lemon 5 mL, Vanilla 10 mL. Colorings: 1 mL yellow.
4. 'Summer' Mint Dessert: Vanilla 10 mL, Peppermint 5 mL. Colorings: 1 mL green.

Put water, Sugar Twin, colorings and flavorings into sauce pan. Stir well. Heat to 43°C or simmer 2 minutes on medium heat. Add 2 well-crushed rennin tablets. Stir only to mix. Pour into cups or glasses. Set 8 to 10 minutes then chill 1 hour before serving. Yield: Four 250 mL servings.

MUSHROOM BEEF CASSEROLE

450 g ground beef
15 mL Worcestershire sauce
300 mL tomato juice
60 mL tomato sauce plus 30 mL
10 mL tomato catsup
10 mL barbecue sauce with mushrooms
30 mL American cheese
1 egg
3 mL onion flakes
1 mL garlic salt
3 mL salt
1 mL pepper
5 mL sugar
100 mL mushrooms

Mix all ingredients except 30 mL tomato sauce in 1-liter pan. Shape into bottom of pan and cover with extra tomato sauce. Bake covered 45 min. at 175°C. Remove from oven and spoon off any grease collected, then bake 15 min. longer uncovered. Garnish with parsley. Yield: 4 servings.

METRIC MASTER MIX

2000 mL flour
45 mL baking powder
15 mL salt
450 mL shortening

1. Stir baking powder and salt into flour.
2. Sift together 3 times.
3. Cut in shortening until it is the consistency of cornmeal.
4. Store in a tight container at room temperature.

(To measure, pile lightly and level off with a spatula or flat edge. Do not sift.)

OATMEAL COOKIES
(Using Metric Master Mix)
600 mL mix
150 mL brown sugar
10 mL cinnamon
1 egg well beaten
130 mL milk
200 mL quick rolled oats
200 mL chopped nuts, and/or raisins
3 mL nutmeg
45 mL granulated sugar

1. Stir mix, sugar, nutmeg, and cinnamon together.
2. Add milk to beaten egg.
3. Add milk and egg mixture to mix, sugar, and cinnamon.
4. Stir until well blended.
5. Stir in oats.
6. Stir in nuts and/or raisins (chocolate chips may be used).
7. Drop by 5 mL measure on greased baking sheet. Makes about 10 doz. cookies.
8. Bake at 190°C (375°F) for 12 to 15 minutes.
9. Cool on cooling rack.

LASAGNA
Sauce
300 grams ground beef
50 mL minced onions
3 mL salt
4 mL garlic salt
3 mL oregano leaves
3 mL basil
250 mL water
250 mL tomato sauce
200 mL tomato paste

1. Brown meat.
2. Stir in remaining ingredients.
3. Reduce heat, cover, and simmer for 20 minutes.

Noodles
1. Bring 3 liters of water to rapid boil in large (4-liter) pan.
2. Add 2 mL salt.
3. Add 1/2 pkg. (7-8 noodles) to water slowly. (Do not break.)
4. Cook until tender (about 18 to 20 min.).
5. Rinse in cold water.
6. Drain well.

Cheese
Blend together:
150 mL cottage cheese
100 mL Parmesan cheese
100 mL grated mozarella cheese
Combine in shallow baking pan as follows:
1. Put a layer of noodles in bottom, then cheese, then meat and repeat layers.
2. Bake 180°C for about 30 minutes.

APRICOT WHOLE WHEAT BREAD
50 mL shortening
150 mL granulated sugar
1 egg
200 mL canned apricots
50 mL apricot syrup
300 mL all-purpose flour
300 mL whole wheat flour
2 mL salt
5 mL baking soda
200 mL buttermilk
200 mL nut meats
rind of 1 orange

Cream shortening and sugar. Beat in egg. Puree apricot and syrup in blender and add to creamed mixture. Sift dry ingredients together. Add sifted ingredients alternately with buttermilk to creamed mixture. Stir just until blended. Fold in nuts and orange rind. Place in greased 23 x 13 cm (9 x 5 in.) loaf pan and bake at 175°C (350°F) for 1 hour. Yield: 1 loaf.

CORN FRITTERS

1 egg
115 mL milk
15 mL melted Crisco
330 mL drained whole kernel corn
200 mL sifted flour
15 mL sugar
5 mL baking powder
4 mL salt
shortening for deep frying

1. Beat egg, add milk, and mix.
2. Stir in melted Crisco and drained corn.
3. Combine flour, sugar, baking powder, and salt.
4. Add these dry ingredients to egg-milk mixture.
5. Stir just enough to evenly distribute the ingredients.
6. Drop from 15 mL measure into shortening heated to 185°C (365°F).
7. Fry for about 4 minutes, until brown and done in the middle.
8. Drain on paper towel.

CHOCOLATE CHIP COOKIES

425 mL flour
2 mL baking soda
2 mL salt
225 mL butter or oleo (1 stick)
175 mL granulated sugar
175 mL brown sugar
1 egg
5 mL vanilla
250 mL chocolate chips (175 g package)
125 mL chopped nuts

Preheat oven to 190°C. Sift together flour, baking soda, and salt. Cream butter and sugars together. Add egg and vanilla, beating until light and fluffy. Stir in dry ingredients. Fold in chocolate chips and nuts. Drop batter from a 5 mL measure about 5cm apart on ungreased baking sheet.

Bake in preheated 190°C (375°F) oven for 8 to 10 minutes, or until golden brown. Makes about 4 to 5 dozen.

OATMEAL BANANA-NUT BREAKFAST BREAD

125 mL margarine
185 mL sugar
2 eggs
3 small bananas, mashed
125 mL milk
125 mL raisins
125 mL oatmeal
375 mL flour
3 mL salt
8 mL baking powder
3 mL soda
125 mL walnuts

Combine in mixing bowl the margarine, eggs, sugar, bananas, and milk. Beat until ingredients are well blended, approximately 2 min. on med. speed if using an electric mixer. Combine remaining ingredients and add all at once to the margarine mixture. Mix until all the ingredients are blended.

Spoon into a greased oatmeal-coated 21 x 11 x 5 cm pan. Bake at 165°C if using glass pan. A 175°C temperature is necessary if the pan is not glass.

Bake for 1 hour or until toothpick comes out clean when inserted into center of bread. Remove from oven to rack and cool for 10 min. Remove from pan, wrap in aluminum foil and store for a day before cutting.

May be served with either butter or cream cheese.

Yield: 1 loaf

UPSIDE DOWN HAMBURGER PIE
(Using Metric Master Mix)

200 mL ground beef
20 mL shortening
100 mL chopped onions
100 mL chopped celery
100 mL green pepper
300 mL tomato soup (1 small can Campbells)
5 mL Worcestershire sauce
450 mL metric master mix
115 mL milk

Sauce

1. Brown meat in hot shortening.
2. Stir constantly.
3. Add onion, celery, and green pepper.
4. Cook 3-5 minutes.
5. Add soup, sauce, and salt.
6. Heat to boiling.
7. Put meat mixture into pie pan.

Biscuit Dough Pie Covering

1. Add milk to master mix.
2. Knead until smooth—about 15 times.
3. Roll into circle (like a pie crust).
4. Put the circle of dough on top of meat mixture in the pie pan.
5. Bake at 240°C (450°F) for 15 minutes.
6. Let stand for 3-5 minutes.
7. Invert over serving platter.
8. Cut into pie-shaped pieces.

COTTAGE CHEESE STUFFED EGGS

6 hard boiled eggs
60 mL cottage cheese
10 mL prepared mustard
3 mL salt
1 mL white pepper
1 mL onion powder
5 mL parsley flakes
1 mL celery seed
10 mL dill relish

Slice hard boiled eggs lengthwise and remove yolks. Mix yolks and other remaining ingredients either by hand or electric mixer. Fill egg whites with the mixture and garnish as desired. Yield: 6 servings.

METRICS AND CLOTHING

Much confusing information is being circulated today about clothing sizes and the metric system. As yet, there is no system of metric sizes for women, men, or children. Many Americans have assumed that the European countries share a "metric size system." Upon closer inspection, it is found that Finland, Sweden, France, Switzerland, Austria, Denmark, and the United Kingdom each has its own variations of garment sizes and identifies the sizes in different ways.

Because of this confusion, the American garment industry hesitates to change to a European system. This industry, however, is ready to go metric. For years pattern companies have been printing international catalogs with body measurements in centimeters and fabric amounts in meters. But American clothing sizes will remain as they are now until a true international sizing system is developed.

The following charts and other illustrations provide valuable information about the sizes of clothing and will help in buying and constructing clothing. Those charts and illustrations are:

Female Figure Types
Male Figure Types
Body Measurements in Metric Units
Clothing Construction Information
Back of Pattern Envelope

In making clothing, we recommend that students not change measurements from customary units to metric units or vice versa. That is, if patterns and instructions are in metric units, the students should make the clothing in metric units. If the patterns and instructions are in customary units, they should make the clothing in customary units.

FEMALE FIGURE TYPES

FIGURE TYPE = BODY SHAPE + HEIGHT + BACKWAIST

TYPE	SHAPE	HEIGHT	BACKWAIST
GIRLS'	not yet maturing	4'2"-5'1" (127cm-155cm)	$11\frac{1}{2}$"-$14\frac{1}{2}$" (29.5cm-36cm)
YOUNG JR. TEEN	developing pre-teen	5'1"-5'3" (155cm-160cm)	$13\frac{1}{2}$"-$15\frac{3}{4}$" (34.5cm-40cm)
JR.PETITE	well-proportioned, but petite	5'-5'1" (152cm-155cm)	14"-$15\frac{1}{2}$" (35.5cm-39cm)
JUNIOR	well-developed short waisted	5'4"-5'5" (163cm-165cm)	15"-$16\frac{1}{2}$" (38cm-41.5cm)
MISSES'	well-proportioned and developed	5'5"-5'6" (165cm-168cm)	$15\frac{1}{2}$"-$17\frac{1}{4}$" (39.5cm-44cm)
HALF-SIZE	fully developed shorter waisted	5'2"-5'3" (157cm-160cm)	15"-$16\frac{1}{4}$" (38cm-41.5cm)
WOMEN'S	larger, more mature shape	5'5"-5'6" (165cm-168cm)	$17\frac{1}{4}$"-18" (44cm-46cm)

MY SHAPE____ +MY HEIGHT____ +MY BACKWAIST____ = MY MEASUREMENTS=MY SIZE____

MY FIGURE TYPE_____

NAME_____ DATE_____ SELECTED PATTERN_____

SIZE=BODY MEASUREMENTS

BODY PART	HOW-TO-MEASURE	MEASUREMENT
BUST	around fullest part	
WAIST	tie string around natural waist and measure over it	
HIPS	around fullest part. Misses'9"(23cm) below waist, shorter figures 7"(18cm) below	

MALE FIGURE TYPES

FIGURE TYPE = BODY BUILD + HEIGHT

TYPE	BUILD	HEIGHT
BOYS'	growing boy beginning to mature	4'-4'10" (122cm-147cm)
TEEN BOYS'	youthful build, not as developed as men	4'1"-5'8" (155cm-173cm)
MEN'S	fully developed neck, shoulders, and hips	5'10" (178cm)

SIZE = BODY MEASUREMENTS

BODY PART	HOW-TO-MEASURE	MEASUREMENT
NECK	around neck base plus ½" for comfort (1.3cm)	
CHEST	around fullest part	
WAIST	tie string around normal waist, measure over string	
HIPS	around fullest part	
SLEEVE LENGTH	from center base of neck over shoulder and bent elbow to wrist	

BODY MEASUREMENTS IN METRIC UNITS

In Centimeters (cm)

APPROVED BY THE MEASUREMENT STANDARD COMMITTEE OF THE PATTERN FASHION INDUSTRY

HOW TO SELECT SIZE

Pattern sizes are based on body measurements. To determine what pattern size you need, take your body measurements and compare them with the listed body measurements on the chart.

Take your body measurements snugly but not too tightly in the undergarments that you would normally wear.

The Simplicity Sewing Book has additional information on pattern measurements and alterations.

Buy coat and suit patterns the same size as dress pattern. Do NOT purchase a larger size.

Buy maternity patterns in the same size you used before pregnancy.

BABIES

Babies sizes are for infants who are not yet walking.

Age	Newborn (1-3 months)	6 months
Weight	3-6 kg	6-8 kg
Height	43-61 cm	61-67 cm

TODDLERS

Toddler patterns are designed for a figure between that of a baby and a child. Toddlers' pants have a diaper allowance; dresses are shorter than the similar Child's size.

Size	½	1	2	3	4	
Breast or Chest	48	51	53	56	58	cm
Waist	48	50	51	52	53	cm
Finished Dress Length	35.5	38	40.5	43	46	cm
Approx. Height	71	79	87	94	102	cm

CHILDREN

Size	2	3	4	5	6	6x	
Breast or Chest	53	56	58	61	64	65	cm
Waist	51	52	53	55	56	57	cm
Hip	—	—	61	64	66	67	cm
Back Waist Length	22	23	24	25.5	27	27.5	cm
Finished Dress Length	46	48	51	56	61	64	cm
Approx. Height	89	97	104	112	119	122	cm

GIRLS

Girls' patterns are designed for the girl who has not yet begun to mature. See below for approximate heights without shoes.

Size	7	8	10	12	14	
Breast	66	69	73	76	81	cm
Waist	58	60	62	65	67	cm
Hip	69	71	76	81	87	cm
Back Waist Length	29.5	31	32.5	34.5	36	cm
Approx. Height	127	132	142	149	155	cm

CHUBBIE

Chubbie patterns are designed for the growing girl who is over the average weight for her age and height. See below for approximate heights without shoes.

Size	8½c	10½c	12½c	14½c	
Breast	76	80	84	88	cm
Waist	71	74	76	79	cm
Hip	84	88	92	96	cm
Back Waist Length	32	34	35.5	37.5	cm
Approx. Height	132	142	149	155	cm

BOYS AND TEEN-BOYS

These size ranges are for growing boys and young men who have not yet reached full adult stature.

	BOYS				TEEN-BOYS				
Size	7	8	10	12	14	16	18	20	
Chest	66	69	71	76	81	85	89	93	cm
Waist	58	61	64	66	69	71	74	76	cm
Hip (seat)	69	71	75	79	83	87	90	94	cm
Neck or Neckband*	30	31	32	33	34.5	35.5	37	38	cm
Height	122	127	137	147	155	163	168	173	cm
Shirt Sleeve	57	59	64	68	74	76	79	81	cm

NOTE: For Toddlers' and Little Boys' (½ to 6) — See Toddlers' and Children's charts.

MEN

Men's patterns are sized for men of average build about 1.78m without shoes.

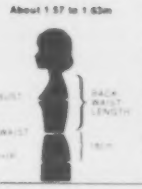
Size	34	36	38	40	42	44	46	48	
Chest	87	92	97	102	107	112	117	122	cm
Waist	71	76	81	87	92	99	107	112	cm
Hip (seat)	89	94	99	104	109	114	119	124	cm
Neck or Neckband*	35.5	37	38	39.5	40.5	42	43	44.5	cm
Shirt Sleeve	81	81	84	84	87	87	89	89	cm

*This is a ready-to-wear measurement, not a pattern "body" measurement. Buy shirt pattern by this measurement.

MISSES

Misses' patterns are designed for a well proportioned, and developed figure, about 1.65m to 1.68m without shoes.

Size	6	8	10	12	14	16	18	20	
Bust	78	80	83	87	92	97	102	107	cm
Waist	58	61	64	67	71	76	81	87	cm
Hip	83	85	88	92	97	102	107	112	cm
Back Waist Length	39.5	40	40.5	41.5	42	42.5	43	44	cm



MISS PETITE

This size range is designed for the shorter Miss figure, about 1.57m to 1.63m without shoes.

Size	6mp	8mp	10mp	12mp	14mp	16mp	
Bust	78	80	83	87	92	97	cm
Waist	60	62	65	69	73	78	cm
Hip	83	85	88	92	97	102	cm
Back Waist Length	37	37.5	38	39	39.5	40	cm

JUNIOR

Junior patterns are designed for a well proportioned, shorter waisted figure, about 1.63m to 1.65m without shoes.

Size	5	7	9	11	13	15	
Bust	76	79	81	85	89	94	cm
Waist	57	60	62	65	69	74	cm
Hip	81	84	87	90	94	99	cm
Back Waist Length	38	39	39.5	40	40.5	41.5	cm

JUNIOR PETITE

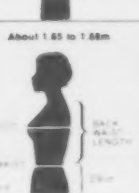
Junior Petite patterns are designed for a well proportioned petite figure, about 1.52m to 1.55m without shoes.

Size	3jp	5jp	7jp	9jp	11jp	13jp	
Bust	76	79	81	84	87	89	cm
Waist	56	58	61	64	66	69	cm
Hip	79	81	84	87	89	92	cm
Back Waist Length	35.5	36	37	37.5	38	39	cm

YOUNG JUNIOR/TEEN

This size range is designed for the developing pre-teen and teen figures, about 1.55m to 1.60m without shoes.

Size	5/6	7/8	9/10	11/12	13/14	15/16	
Bust	71	74	78	81	85	89	cm
Waist	56	58	61	64	66	69	cm
Hip	79	81	85	89	93	97	cm
Back Waist Length	34.5	35.5	37	38	39	40	cm



WOMEN

Women's patterns are designed for the larger, more fully mature figure, about 1.65m to 1.68m without shoes.

Size	38	40	42	44	46	48	50	
Bust	107	112	117	122	127	132	137	cm
Waist	89	94	99	105	112	118	124	cm
Hip	112	117	122	127	132	137	142	cm
Back Waist Length	44	44	44.5	45	45	45.5	46	cm

HALF-SIZE

Half size patterns are for a fully developed figure with a short back waist length, about 1.57m to 1.60m without shoes.

Size	10½	12½	14½	16½	18½	20½	22½	24½	
Bust	84	89	94	99	104	109	114	119	cm
Waist	69	74	79	84	89	96	102	108	cm
Hip	89	94	99	104	109	116	122	128	cm
Back Waist Length	38	39	39.5	40	40.5	40.5	41	41.5	cm

SKIRTS, SLACKS & SHORTS:

Select by waist measurement. For hip-hugger patterns OR if hips are two sizes larger in proportion to waist, select size by hip measurement.

Misses									
Waist	58	61	64	67	71	76	81	87	cm
Hip	83	85	88	92	97	102	107	112	cm
Junior									
Waist	57	60	62	65	69	74			cm
Hip	81	84	87	90	94	99			cm
Women									
Waist	89	94	99	105	112	118	124		cm
Hip	112	117	122	127	132	137	142		cm

Miss Petite									
Waist	60	62	65	69	73	78			cm
Hip	83	85	88	92	97	102			cm
Junior Petite									
Waist	56	58	61	64	66	69			cm
Hip	79	81	84	87	89	92			cm
Young Junior/Teen									
Waist	56	58	61	64	66	69			cm
Hip	79	81	85	89	93	97			cm

CLOTHING CONSTRUCTION INFORMATION

YARDS TO METERS
(Slightly Rounded For Your Convenience)

Always check the envelope back for amount of fabric required for each pattern.

Yards	Meters	Yards	Meters	Yards	Meters	Yards	Meters	Yards	Meters
1/8	0.15	2 1/8	1.95	4 1/8	3.80	6 1/8	5.60	8 1/8	7.45
1/4	0.25	2 1/4	2.10	4 1/4	3.90	6 1/4	5.75	8 1/4	7.55
3/8	0.35	2 3/8	2.20	4 3/8	4.00	6 3/8	5.85	8 3/8	7.70
1/2	0.50	2 1/2	2.30	4 1/2	4.15	6 1/2	5.95	8 1/2	7.80
5/8	0.60	2 5/8	2.40	4 5/8	4.25	6 5/8	6.10	8 5/8	7.90
3/4	0.70	2 3/4	2.55	4 3/4	4.35	6 3/4	6.20	8 3/4	8.00
7/8	0.80	2 7/8	2.65	4 7/8	4.50	6 7/8	6.30	8 7/8	8.15
1	0.95	3	2.75	5	4.60	7	6.40	9	8.25
1 1/8	1.05	3 1/8	2.90	5 1/8	4.70	7 1/8	6.55	9 1/8	8.35
1 1/4	1.15	3 1/4	3.00	5 1/4	4.80	7 1/4	6.65	9 1/4	8.50
1 3/8	1.30	3 3/8	3.10	5 3/8	4.95	7 3/8	6.75	9 3/8	8.60
1 1/2	1.40	3 1/2	3.20	5 1/2	5.05	7 1/2	6.90	9 1/2	8.70
1 5/8	1.50	3 5/8	3.35	5 5/8	5.15	7 5/8	7.00	9 5/8	8.80
1 3/4	1.60	3 3/4	3.45	5 3/4	5.30	7 3/4	7.10	9 3/4	8.95
1 7/8	1.75	3 7/8	3.55	5 7/8	5.40	7 7/8	7.20	9 7/8	9.05
2	1.85	4	3.70	6	5.50	8	7.35	10	9.15

AVAILABLE FABRIC WIDTHS

21"	54 cm	48"	122 cm
25"	64 cm	50"	127 cm
27"	70 cm	54"/56"	140 cm
35"/36"	90 cm	58"/60"	150 cm
39"	100 cm	68"/70"	175 cm
44"/45"	115 cm	72"	180 cm

AVAILABLE ZIPPER LENGTHS

4"	10 cm	10"	25 cm	22"	55 cm
5"	12 cm	11"	28 cm	24"	60 cm
6"	15 cm	12"	30 cm	26"	65 cm
7"	18 cm	14"	35 cm	28"	70 cm
8"	20 cm	16"	40 cm	30"	75 cm
9"	23 cm	18"	45 cm	36"	90 cm
		20"	50 cm		

CONSTRUCTION DETAILS

Stitches per centimeter	5	Edgestitching (from an edge)	1 mm
Stitch length (average)	2 - 2.5 cm	Top stitching (from edge)	6 mm
Seam allowance	1.5 cm	Center zipper stitching (from seam)	6 mm
Average hem allowance	5 cm	Graded seam	
Rolled hem (depth)	1 cm	cut short allowance	3 mm
Waistband (width)	2.5 - 3.0 cm	cut longer allowance	6 mm
Zipper, skirt (long)	18 cm	Quilting stitch (hand)	2 mm
Zipper, trousers (long)	28 cm	Pad stitching	6 mm apart

83

BACK OF PATTERN ENVELOPE

4" (10cm) OF KNIT (CROSSWISE DIRECTION) MUST STRETCH FROM HERE → TO HERE OR MORE →

1" 2" 3" 4"

5589

MISSES' SET OF TOPS, SKIRT AND PANTS OR SHORTS - FOR UNBONDED STRETCHABLE KNITS: Tops have extended shoulder line. A has sleevebands and drawstring in waistline casing. B, C, D, E have turned up sleeves. B, C, E have drawstring in lower casing. D, or E with cowl collar have pockets in side seam openings. Skirt has elastic in waistline casing. Pants or shorts have elastic in back casing.

BODY MEASUREMENTS									
Size	6	8	10	12	14	16	18	20	
Bust	30½	31½	32½	34	36	38	40	42	Ins.
Waist	23	24	25	26½	28	30	32	34	"
Hip	32½	33½	34½	36	38	40	42	44	"
Back waist length	15½	15¾	16	16¼	16½	16¾	17	17¼	"

BODY MEASUREMENTS									
	6	8	10	12	14	16	18	20	
	78	80	83	87	92	97	102	107	cm
	58	61	64	67	71	76	81	87	cm
	83	85	88	92	97	102	107	112	cm
	39.5	40	40.5	41.5	42	42.5	43	44	cm

SIZES	Petite	Small	Medium	Large	
	6-8	10-12	14-16	18-20	
VIEW A - Top 58/60" *	1	1⅛	1⅛	1⅛	Yds.
VIEW A - Skirt 58/60" *	1⅛	1⅛	1⅛	1⅛	"
VIEW B - Top 58/60" *	1½	1½	1⅝	1⅝	Yds.
VIEW B or E - Pants 58/60" *	1⅜	1⅜	1⅜	2⅜	Yds.
VIEW C - Top 58/60" *	1⅛	1⅛	1⅛	1⅛	Yds.
VIEW C - Shorts 58/60" *	⅞	⅞	⅞	⅞	Yd.
VIEW D - Top 58/60" *	1⅜	1⅜	1⅜	1⅜	Yds.
VIEW E - Top 58/60" *	1¾	1¾	1¾	2	Yds.
Finished length from back of regular neckline					
Top A, B or C	23⅛	23⅝	24⅛	24⅝	Ins.
Top D or E	27⅛	27⅝	28⅛	28⅝	"
Finished length from natural waistline					
Skirt A	26⅝	27⅛	27⅝	28⅛	"
Finished side length					
Pants B or E	43½	44	44½	45	"
Width at lower edge					
Skirt A	64¼	67¼	71⅛	76¼	"
Pants B or E, each leg	19¾	20⅝	22⅛	23⅝	"

BODY MEASUREMENTS	Petite	Small	Medium	Large	
	6-8	10-12	14-16	18-20	
VIEW A - Top 150cm *	0.90	1.20	1.30	1.30	m
VIEW A - Skirt 150cm *	1.60	1.70	1.70	1.70	m
VIEW B - Top 150cm *	1.40	1.40	1.40	1.50	m
VIEW B or E - Pants 150cm *	1.30	1.30	1.60	2.10	m
VIEW C - Top 150cm *	1.20	1.20	1.30	1.30	m
VIEW C - Shorts 150cm *	0.60	0.60	0.70	0.80	m
VIEW D - Top 150cm *	1.50	1.50	1.50	1.50	m
VIEW - Top 150cm *	1.60	1.60	1.60	1.80	m
	59	60	61	63	cm
	69	70	71	73	cm
	68	69	70	71	cm
	110	112	113	114	cm
	163	171	182	194	cm
	50	52	56	60	cm

*With Nap **Without Nap ***With or Without Nap

Use *With Nap yardages and layouts for pile, shaded or one-way design fabrics. Additional fabric may be needed to match stripes, plaids, one-way designs.

SUGGESTED FABRICS: Unbonded Stretchable Knits such as Cotton Knits, Wool or Synthetic Jersey, Knitted Terry, Knitted Velour, Sweater Knits.

NOTIONS: Polyester Thread; Skirt - 1 Yd. (1.00m) ½" (1.3cm) Wide Elastic; Pants or Shorts - ½ Yd. (0.50m) ½" (1.3cm) Wide Elastic; Top A, Skirt, Pants or Shorts - Optional Stretch Lace.

21 PATTERN PIECES

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APPENDIX

GLOSSARY OF TERMS

calorie. The amount of heat required at a pressure of one atmosphere to raise the temperature of one *gram* of water one degree Celsius.

Calorie. (With a capital C, also called kilocalorie) The amount of heat required to raise the temperature of one *kilogram* of water one degree Celsius. (This is the unit commonly used by consumers.)

hard conversion. (Of an object or package from customary to metric units of measurement) A process in which an object or package is redesigned to a size that is convenient for metric measurement; the dimensions are then designated in metric units. For a package, the quantity of the contents is given in metric units. Example: Suppose a $1\frac{1}{2}$-ounce chocolate bar is to be converted. If the size of the bar is changed to 50 grams, and the package is redesigned for this bar, a hard conversion would result. The package would then be marked *50 grams*.

hectare. 10 000 square meters. A square with sides 100 meters long.

joule. The amount of work done when an applied force of one newton moves a body through a distance of one meter in the direction of force.

mass. The quantity of matter in an object or body. This quantity is more commonly spoken of (except among scientists) as the *weight* of the object or body.

soft conversion. (Of an object or package from customary to metric units of measurement) A process in which the object or package itself remains unchanged and the only change is that the dimensions or size in metric units is added. For a package, the metric dimensions or size is printed on the label in addition to the customary units. Example: For a $1\frac{1}{2}$-ounce chocolate bar to be "soft converted," the only change made is that *42 grams* is added after *$1\frac{1}{2}$ ounces* on the label.

weight. The force of gravity acting upon an object or body. More commonly used (except among scientists) to mean the *mass* of an object or body as defined in this glossary.

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